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THE SHIELD

Azure an Annulet Or surmounted of a Compass Rose of eight points Argent charged in the centre with a Maple leaf slipped Gules on a Canton also Argent a representation of the Royal Crown proper

THE CREST

In front of a Canada Goose wings elevated and displayed the northern hemisphere of a Terrestrial Globe all proper

THE SUPPORTERS

On either side a Malamute sled-dog proper

The Society's ambition is to make itself a real force in advancing geographical knowledge, and in disseminating information on the geography, resources and people of Canada. In short, its aim is to make Canada better known to Canadians and to the rest of the world.

As one of its major activities in carrying out its purpose, the Society publishes a monthly magazine, the Canadian Geographical Journal, which is devoted to every phase of geography — historical, physical and economic — of Canada, of the British Commonwealth and of the other parts of the world. It is the intention to publish articles in this magazine that will be popular in character, easily read, well illustrated, and informative.

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CANADIAN GEOGRAPHICAL JOURNAL

Editor - WILLIAM J. MEGILL

This magazine is dedicated to the presentation in authentic and popular form, with extensive illustrations, of the broad pattern of Canadian life and its industrial, physical, and cultural foundations.

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Ramsgate, Kent, England.

Map showing the general arrangement of the Bersimis Development.

Carte indiquant l'aménagement de la rivière Bersimis dans son ensemble.

FLEUVE ST. LAURENT

The Desroches and Bersimis Dams at the foot of Lac Casse impound the water to create a 300 square mile reservoir.

Les barrages Desroches et Bersimis à la décharge du lac Cassé retiennent les eaux pour créer un réservoir de 300 milles carrés.

Bersimis:

The Development of a River — *La mise en valeur d'une rivière*

by W. J. W. McNAUGHTON

DEEP IN the wilderness on the north shore of the St. Lawrence River, a group of engineers was at work on plans to harness the waters of the Betsiamites River and the watershed that feeds its turbulent passage.

To ensure success for their plans, vast quantities of clay were necessary to make the impervious cores of the dams around which the entire project centred. Faced with the prospect of stupendous transportation problems if no local clay was available, they viewed the prospect of a tedious search with little relish.

A party of the local Montagnais Indians was engaged in the pastime of watching the white man performing his mysterious operations and one of the engineers, on an inspired chance, asked if they knew of any clay deposits in the area. Heads shook; the Indians had little use for clay: trapping was their business. Then one of them recalled that he had seen beaver building dams near the falls where the Betsiamites River spills from Lac Cassé, heart of the proposed development. He had

LOIN dans les régions sauvages de la rive nord du fleuve St-Laurent, des ingénieurs élaboraient des plans pour capter les eaux turbulentes de la rivière Betsiamites et du bassin hydrographique qui l'alimente.

Pour la réalisation des ouvrages à exécuter, il leur fallait disposer d'énormes quantités d'argile qu'exigeait l'imperméabilisation des barrages. Menacés d'avoir à résoudre de formidables problèmes de transport s'ils ne trouvaient pas l'argile nécessaire dans la région, la perspective d'avoir à entreprendre de fastidieuses recherches de dépôts ne leur souriait pourtant guère.

Un groupe de Montagnais s'intéressait à observer les blancs et leurs mystérieuses occupations. L'un des ingénieurs, dans un moment d'inspiration, leur demanda s'ils connaissaient un dépôt d'argile dans les environs. Ils hochèrent la tête négativement, les Indiens n'utilisant pas la glaise car ils ne s'occupaient que de chasse. Puis l'un d'entre eux se rappela avoir vu des castors se constuire des barrages près des chutes par où les eaux du lac

Lac Casse Falls before the engineers turned their power into 1,200,000 horsepower of useful energy.

Les chutes du lac Cassé avant le harnachement de leur turbulence en 1 200,000 chevaux d'énergie utilisable.

noticed the beaver carrying clay for their construction work and thought he could show the white men the trail used by the animals.

With the engineers following, he set off down a trail which his practised eye discerned in the bush. Within minutes the party came to a spot where his hunting knowledge was able to show that animals had excavated. Hearts leaped as the men ran the material through their fingers. It was clay. Further investigation showed that the deposit was more than enough for the entire project. Overjoyed at the whim of Nature that, long centuries ago, had dumped the massive deposit of glacial till exactly where it was needed, the engineers returned to camp feeling that this was, indeed, an omen that Nature was on their side.

Known a few years ago only to geographers, a few hydrologists, and the Indians who set their trap-lines in the area, the Betsiamites today is

Cassé s'échappent pour former la rivière Betsiamites, précisément à l'endroit prévu pour les barrages. Il avait vu les bêtes transporter de la glaise pour exécuter leurs travaux; il pourrait indiquer aux blancs le sentier suivi par les castors.

Précédant les ingénieurs, il suivit une piste que ses yeux savaient discerner dans la broussaille. En quelques minutes, on arriva à un endroit que le chasseur reconnut comme ayant été creusé par les castors. Les ingénieurs eurent un coup au coeur en broyant la terre entre leurs doigts . . . C'était de l'argile! On calcula qu'il y avait plus de glaise qu'il n'en fallait pour réaliser le projet. Enthousiasmés par ce caprice de la nature qui, des siècles auparavant, à l'époque glaciaire, avait amassé cet énorme dépôt précisément à l'endroit requis. Les ingénieurs retournèrent à leur camp avec le sentiment que la nature était décidément en leur faveur.

Connue jusqu'alors, seulement des géographes,

recognized by engineers throughout the world as one of the great engineering achievements. Its wild waters, now tamed, spin giant turbines driving generators to send energy pulsing 400 miles to Montreal to feed the insatiable appetite of the metropolitan industrial complex.

An unwieldy name, Betsiamites was changed to Bersimis to facilitate communications and it is by this name of Bersimis that the river brings world-wide renown to the engineers of Hydro-Quebec who conceived the project.

Bersimis I

In 1952, faced with unprecedented demands for power, Hydro-Quebec had already started work on the second phase of the Beauharnois development on the St. Lawrence. With several generating units of this project still to be installed, it became apparent that even this addition could not meet the anticipated demands of a few years later.

Because of the time taken to design and construct an important generating station, it was imperative that new construction should start with the least possible delay. The choice of a new site was pressing.

On the doorstep of Montreal was the potential of the Lachine Rapids. Here was a tremendous source of energy right where it was needed. Any construction at Lachine, however, had to fit into the over-all picture of the St. Lawrence Seaway. At that time, the plans for the Seaway were still

de quelques hydrauliciens et des Indiens qui venaient poser leurs pièges aux environs, la rivière Betsiamites est maintenant devenue familière aux ingénieurs du monde entier comme l'une des grandes oeuvres du génie moderne. Ses eaux tumultueuses, désormais canalisées, font tourner les turbines géantes de générateurs dont l'énergie court sur une distances de 400 milles jusqu'à Montréal pour répondre à l'appétit insatiable du complexe industriel de la région métropolitaine.

Le nom de Betsiamites a été remplacé par Bersimis pour des raisons de prononciation et c'est sous ce dernier nom que la rivière a valu une réputation mondiale aux ingénieurs de l'Hydro-Québec qui ont conçu le projet.

Bersimis I

En 1952, en présence d'une demande sans précédent d'énergie, l'Hydro-Québec était déjà en voie d'aménager la seconde section de la centrale de Beauharnois sur le Saint-Laurent. Il y restait encore plusieurs groupes générateurs à installer, mais il devenait évident qu'avant longtemps cela ne suffirait pas.

La préparation des plans d'un important aménagement et sa construction nécessitant de longs délais, il devenait nécessaire de commencer le plus tôt possible — Mais où ?

Au seuil de Montréal, juste à l'endroit requis, se trouvait le potentiel énergétique considérable des rapides de Lachine. Toutefois, tout projet de cen-

Water, liberated from the spill gate, pours down the Bersimis Falls while work proceeds on the 200 foot high dam at the Lac Casse outlet.

Les eaux, provenant des vannes du déversoir, dévalent les chutes Bersimis pendant que les travaux se poursuivent au barrage de 200 pieds de hauteur à la décharge du lac Cassé.

A cascade of excess water thunders from the gates of the spillway in the main dam at Bersimis II.

Le trop plein s'écoule en cascades tonitruantes des vannes du barrage principal à Bersimis II.

in the negotiation stage — and had been for thirty years! There was little to indicate that the seemingly interminable procrastination of a group of United States interests would end and allow work to start on the Seaway. Even more serious was the problem of severe icing conditions at Lachine during the winter months. A long period of study and experimental work would be necessary before the potential of Lachine could be exploited. New power must become available by the fall of 1956. Time was against Lachine.

Also close at hand was the possibility of further development at Beauharnois by the addition of the third, and final, phase of this giant generating station. But little of the potential here could be classed as "firm" power. Here again the ice problem was a major factor. In the winter, when most power is needed, ice in the intake canal at Beauharnois would preclude full use of the generating units. Only a part of any addition there would be available during the winter and even that would seriously interfere with the amount of water that could flow through the turbines of the nearby Cedars power house. The potential gain at Beauharnois would not meet the demands foreseen for the fall of 1956.

trale à Lachine ne pouvait se réaliser qu'en fonction de la canalisation du Saint-Laurent qui en était alors encore au stade des négociations. Cela durait depuis trente ans et rien n'indiquait la fin prochaine des interminables atermoiements de divers groupes américains qui bloquaient la mise en marche des travaux de canalisation. Mais contre Lachine, jouait surtout le problème des glaces, particulièrement aigu à cet endroit en hiver. Avant de pouvoir exploiter ce potentiel énergétique, une longue période d'études et d'expériences allait être nécessaire. Comme il fallait pouvoir disposer de plus d'énergie pour l'automne 1956, Lachine était ainsi éliminé.

Il était aussi possible d'aménager la troisième et dernière section de la centrale géante de Beauharnois. Mais ici encore le problème des glaces constituait un facteur de première importance. L'hiver, en effet, lorsque la demande d'énergie est à son maximum, la glaciation de l'eau du canal ne permet pas d'utiliser les générateurs à leur plein rendement. Une partie seulement de ce nouvel aménagement pourrait être utilisé en hiver, et cela aurait même pour effet de diminuer sérieusement la quantité d'eau necessaire à la marche des turbines de la centrale voisine des Cèdres. Le gain net

The Carillon site on the Ottawa River was considered. But here, the peculiar hydraulic conditions at the site limited its exploitation. The amount of power available was about 800,000 horsepower during maximum water-flow conditions, but the amount of continuous, dependable power was only about half of this amount. The nature of the site favoured its use as a "peaking" plant that would be used only to boost the amount of power supplied by other plants at times of maximum demand. Further, although the development of Carillon might meet the immediate needs of Montreal, there would be no surplus power for transmission to other rapidly expanding areas whose needs were acute.

Hydro-Quebec decided to investigate the possibilities of large rivers on the north shore of the St. Lawrence east of the St. Maurice and Saguenay Rivers, both of which were almost fully developed. The Betsiamites, or Bersimis as it is now known, offered distinct advantages. The flow of the river could be controlled very easily at the outlet of Lac Cassé where a huge block of power in excess of a million horsepower was available, while further development was possible down-stream. Preliminary survey indicated that a cost of $125 per horsepower installed could be anticipated. The site looked most attractive.

Even after transmitting the power 400 miles to Montreal, it would be cheaper than the cost of power from Lachine. Bersimis appeared to be the logical answer to the immediate problem and it was decided to institute the project without delay. Work preliminary to construction started in June 1953 and actual construction commenced in October of that year.

Today, only six years after the search for clay, eight of the world's largest turbines are spinning below Lac Cassé, converting 1,200,000 horsepower into useful energy. The electrical systems served by the development are enriched by a potential of five-billion kilowatt-hours annually. Twenty miles down-stream, the Bersimis II development is rapidly nearing completion and will soon add another 900,000 horsepower to Quebec's vast treasure of cheap electric power.

The view from the rocky crest of the enormous dam, with its core of clay, and the immensity of

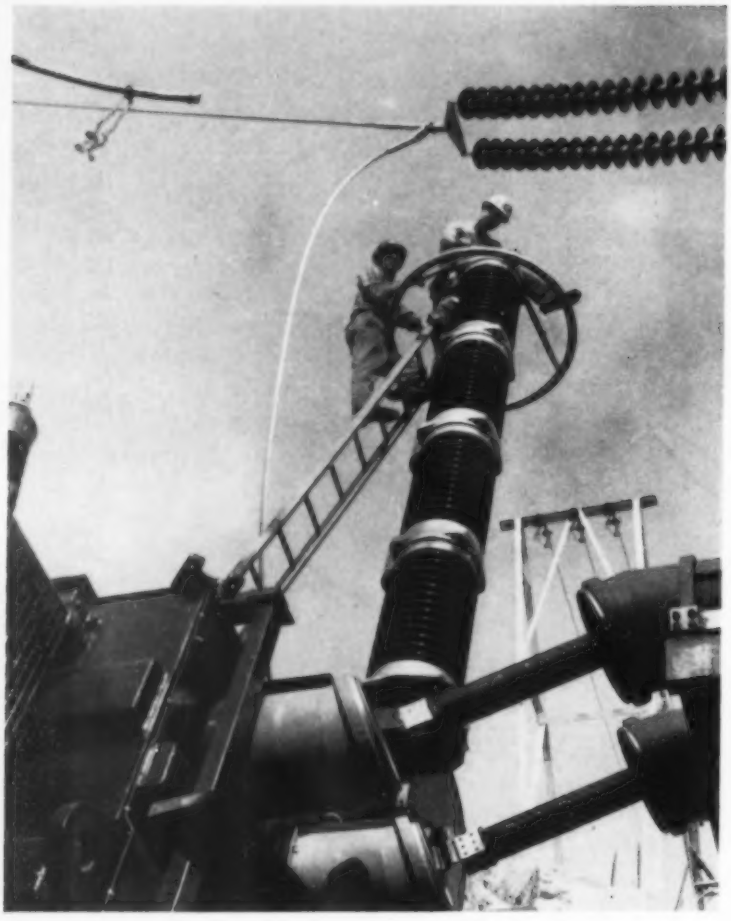
A crew carries out tests inside the concrete dam at Bersimis II.

Une équipe poursuit des vérifications techniques à l'intérieur du barrage en béton à Bersimis II.

à réaliser à Beauharnois ne pouvait être suffisant pour combler les besoins prévus pour l'automne 1956.

On considéra également le site de Carillon sur la rivière Outaouais, mais des conditions hydrauliques particulières en limitaient l'exploitation. Au débit maximum, il était possible d'y mettre en valeur 800,000 chevaux, mais le potentiel réel sur lequel on pouvait continuellement compter ne représentait approximativement que la moitié de cette puissance. La nature du site se prêtait plutôt à l'aménagement d'une centrale d'appoint pour suppléer les autres centrales aux heures de pointe. D'ailleurs, même si le projet avait pu satisfaire les besoins immédiats de Montréal, il ne serait resté aucun surplus d'énergie pour répondre aux besoins de plus en plus pressants des autres régions en état de rapide expansion.

L'Hydro-Québec décida alors de procéder à des recherches pour déterminer le potentiel d'énergie des principales rivières de la rive nord du Saint-Laurent, à l'est du Saint-Maurice et du Saguenay, deux rivières déjà presqu'entièrement aménagées. Bersimis offrait de nets avantages. Il était facile de contrôler le volume d'écoulement de ses eaux à sa source, au lac Cassé. On pouvait de plus obtenir



Connecting power cable to one of the giant transformers at Bersimis II.

Cable de connexion à l'un des transformateurs géants à Bersimis II.

this project completed by mere man, cause the imagination to leap. The impounded water plunges now from a gate-controlled spillway before reentering the channel it has carved through the age-old valley leading to the St. Lawrence River. Behind are the placid waters of the great storage area created by impounding Lakes Cassé and Pipmuacan and all the waters back to Lac Pamouscachiou. Below is the 200-foot drop to the floor of the valley where the wild waters tumble in their headlong flight to the sea — but only those waters not required to serve the ends of man.

The greater part of the water that hurries down the rocky valley of the Betsiamites is allowed to pass on its way only after having been directed seven and a half miles through the heart of a mountain where it turns the eight great machines in a power house carved from the solid rock deep inside the mountain. The story of how this turbulent river was turned to the service of the province is one of the romances of this age of engineering miracles.

Bersimis is not a mere piece of machinery to generate electricity, it is a creation of new civilization in a former wilderness. Here the Canadian's heritage of abundant water resources has been exploited to its greatest advantage for the benefit of

au-delà d'un million de chevaux d'une seule centrale, sans compter l'aménagement possible d'une autre centrale en aval. Les recherches préliminaires permirent d'établir un coût approximatif de $125 le c.v. Le site avait donc beaucoup d'attraits.

Même transmise jusqu'à Montréal, sur une distance de 400 milles, cette énergie aurait un coût encore plus bas que si elle était produite à Lachine. Bersimis paraissait offrir la solution logique au problème du moment et on décida d'exécuter le projet immédiatement. On commença les travaux préliminaires en juin 1953 et la construction elle-même débuta en octobre.

Aujourd'hui, six ans seulement après la découverte du dépôt d'argile, huit de plus grosses turbines au monde, situées en aval du lac Cassé, pivotent sur elles-mêmes pour convertir un potentiel de 1,200,000 chevaux en énergie utilisable. Les réseaux desservis par cet aménagement bénéficient annuellement de quelque cinq milliards de kilowattheures. A vingt milles en aval, l'aménagement de Bersimis II, sur le point d'être terminé, augmentera de 900,000 chevaux l'immense trésor d'énergie électrique à bon marché du Québec.

Vu du faîte rocheux de l'énorme barrage imperméabilisé au moyen de glaise, l'immensité de ce projet exécuté par l'homme fait tressaillir d'admiration. L'eau, maintenant retenue, plonge par une passe-déversoir à débit contrôlé avant de reprendre, jusqu'au Saint-Laurent, la voie qu'elle s'est creusée au cours des siècles à travers les vallées. En arrière s'étendent les eaux calmes de l'immense réservoir créé par l'endiguement des lacs Cassé et Pipmouacan et de toutes les eaux du bassin environnant, jusqu'au lac Pamouscachiou. Aux pieds, l'eau tombe d'une hauteur de 200 pieds au fond de la vallée où elle coule avec turbulence vers la mer.

Avant de rejoindre sa route naturelle dans la vallée de la Bersimis toutefois, la plus grande partie de l'eau accumulée devra d'abord dévaler, sur une distance de sept milles et demi, au coeur d'une montagne dans laquelle elle aura fait tourner les huit énormes machines de la centrale logée dans une caverne creusée en plein roc. La manière dont cette tumultueuse rivière a été mise au service de la province de Québec constitue une réalisation digne de cet âge où le génie fait des miracles.

Bersimis n'est pas une simple mécanique pour produire de l'électricité; c'est la civilisation implantée là où il n'y avait que sauvagerie. Les abondantes ressources hydrauliques, richesse du Canada, y ont été exploitées à leur maximum au

the people of Quebec and of Canada. Here, utility and beauty have been combined into a development that makes one proud to stand before the world and say, "We did this in Canada."

Electric energy is the modern measure of a country's economic well-being; standard of living is gauged by the abundance of cheap electric power. Although most outsiders know of Quebec as a land of lakes and rushing rivers, the province is generally considered in other parts of Canada, and in the rest of the world, to be the home of handicrafts, of the woodsman and the trapper; a place to spend a vacation and see the storied landmarks.

These things may be true, but behind them is the "other" Quebec. Quebec has more installed electrical capacity *per capita* than any other country in the world. It plans to develop many more millions of horsepower at a cost exceeding a billion dollars during the next decade. It is a land of ever-growing industrialization, a province that is

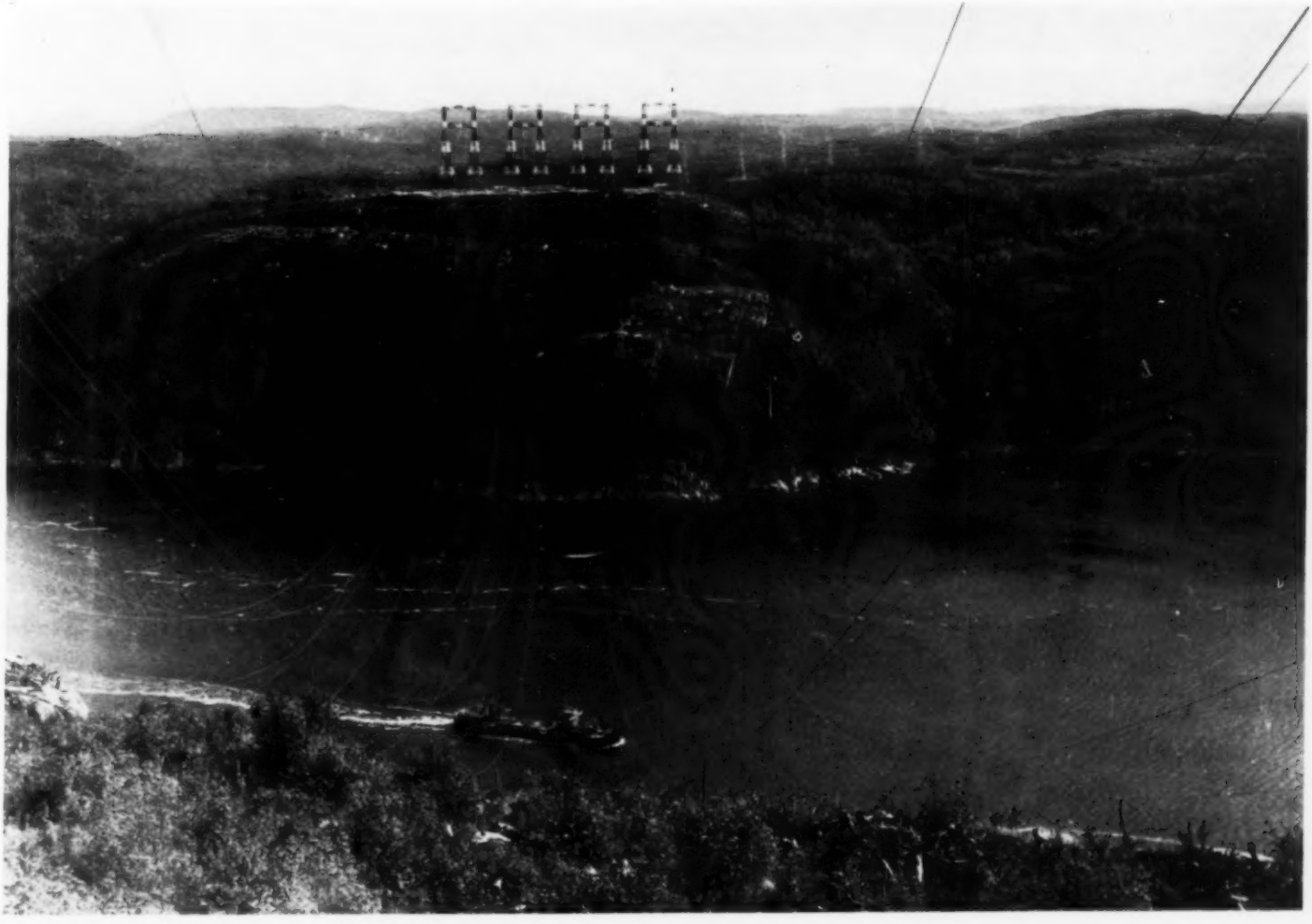
bénéfice du Québec et du Canada. On y a réuni le pratique et la beauté pour réaliser un aménagement qui nous permet de dire fièrement au reste du monde: "Voilà ce que nous avons fait au Canada."

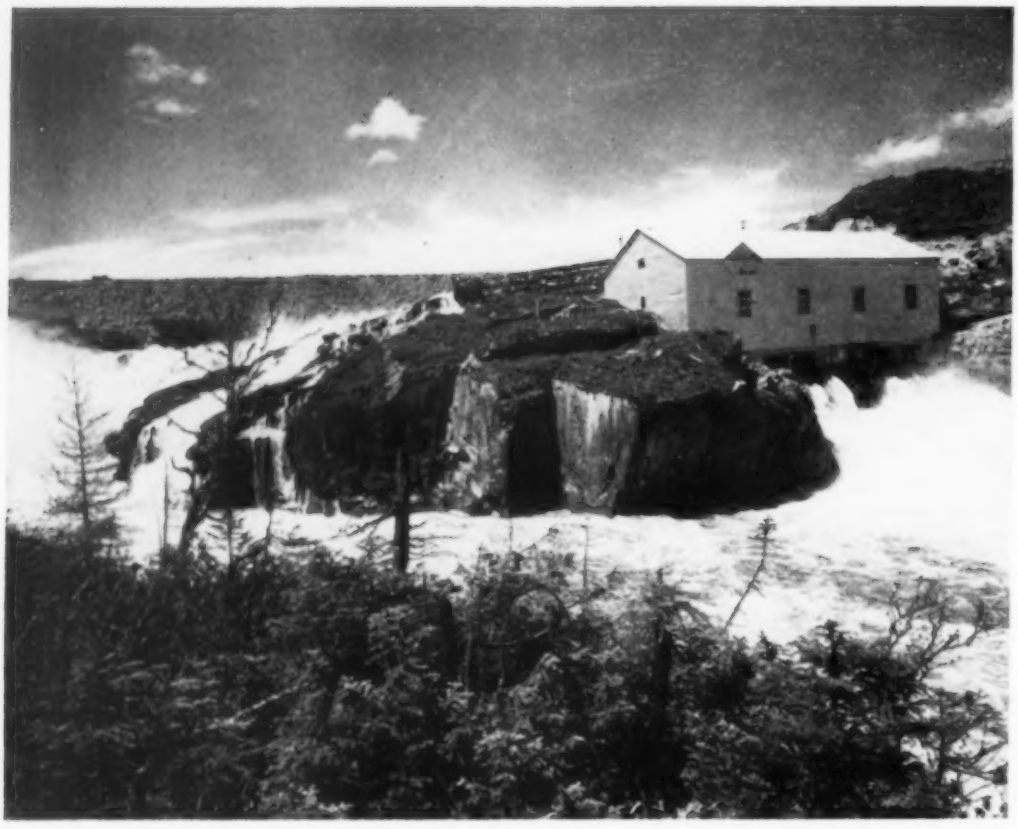
A notre époque, l'énergie électrique est devenue l'unité de mesure de la prospérité économique d'un pays: le niveau de vie est fonction de la plus ou moins grande abondance d'électricité. La plupart en dehors du Québec connaissent cette province comme une terre de lacs et de rivières rapides, et cependant on la considère généralement comme le pays de l'artisan, du bûcheron et du trappeur, comme un lieu de villégiature, riche en souvenirs historiques.

Mais il y a aussi l'"autre" Québec. Cette province dispose par habitant d'une plus grande puissance électrique installée que tout autre pays au monde, et elle se propose d'aménager pendant la prochaine décennie plusieurs autres millions de chevaux au coût de plus d'un milliard de dollars. C'est un territoire qui s'industrialise de plus en

The 300,000 volt transmission line carrying power from Bersimis to Montreal here crosses the Saguenay River.

Les lignes de haute tension de 300,000 volts traversent la rivière Saguenay, transportant l'énergie de Bersimis à Montréal.





The 15,000 horsepower temporary power plant moved from St. Timothé to provide power during construction of Bersimis I.

La centrale temporaire de 15,000 chevaux transportée de St. Timothée pour fournir l'énergie électrique durant la construction de Bersimis I.

outstanding for its wealth in a country that is the envy of the world. And Bersimis is one of the links in the chain of power stations that makes this province great.

When the decision was made to proceed with the development of the river, the work preliminary to construction was of a magnitude to stagger the imagination. Construction camps had to be established, vast quantities of materials had to be shipped to remote wilderness sites and thousands of men had to live and work where few men had ever been before. Yet, in a few months, a town of more than 5,000 people had been created deep in the bush, and more than 5,000 men were working on the dams and roads and tunnels.

Working from old logging trails that took them in part way, the Commission built roads through the forest; roads over which had to travel every pound of supplies used in the gigantic task. Everything from candies and cigarettes for the canteens to transformers weighing almost a hundred tons went up the newly made roads.

A wharf was built at Forestville, the port town of the Anglo-Canadian Pulp and Paper Company. To this wharf came shipload after shipload of men and materials—excavators, tractors, earth movers, lathes, borers and milling machines, food, clothing, wire, rope, structural steel, lumber, drafting equipment, safety pins and magazines. Food to serve 15,000 meals a day, refrigerators to store

plus, une province remarquable par sa richesse dans un pays qui suscite l'envie du monde entier, et Bersimis est l'un des maillons de la chaîne de centrales hydroélectriques qui font sa puissance.

Une fois décidé l'aménagement de la rivière, les travaux préliminaires à la construction apparurent d'une ampleur renversante. Il fallait, en un lieu inhabité et sauvage, aménager des camps, expédier de vastes quantités de matériaux et envoyer des milliers d'hommes s'y établir et travailler. Pourtant, on organisa en quelques mois, loin dans la forêt, une ville de plus de 5,000 habitants et ces gens se mirent à l'oeuvre pour construire routes, barrages et tunnels.

Utilisant sur une certaine distance le tracé d'une ancienne route de chantier fort accidentée, l'Hydro-Québec fit construire, en pleine forêt, des routes qui devaient servir au transport de tout ce qu'il fallait pour accomplir la gigantesque tâche, depuis les bonbons et les cigarettes jusqu'aux transformateurs pesant près de 100 tonnes.

Un quai fut construit à Forestville, port de l'Anglo-Canadian Pulp and Paper Company. Des navires s'y sont constamment relayés, apportant de tout, des excavateurs, des tracteurs, des grues, des tours, des machines, des aliments, des vêtements, du fil de fer, du câble, des poutres d'acier, du matériel à dessin, jusqu'aux épingles de sûreté et revues. Des vivres pour servir 15,000 repas par jour, des réfrigérateurs pour conserver les oeufs

the 10,000 eggs consumed each day, and the eggs themselves — all were unloaded at Forestville to begin the long haul into the bush. Shiploads of cement were unloaded into silos at the wharf to be reloaded into a fleet of cement trucks for delivery to other silos at the site. A ceaseless procession of vehicles, including 100-ton tractor-trailer units, wended its way up the road . . . and still the trucks pound their way through the forest to hasten the work to its ultimate completion.

In addition to a power development, a new town had been added to the map of Canada. Named after Mgr A. N. Labrie, who was then Bishop of the Gulf of St. Lawrence, Labrieville was built to house permanent operating personnel for the two power sites, Bersimis I and Bersimis II. Beautifully laid out in an idyllic setting on the floor of

qu'on consommait à raison de 10,000 par jour — tout cela était déchargé à Forestville pour être ensuite apporté jusqu'à l'endroit des travaux. Des cargaisons entières de ciment passaient des navires à un énorme silo sur le quai, et de là aux camions qui le transportaient à d'autres silos à proximité des travaux en cours. Une procession ininterrompue de véhicules de tous genres, y compris des camions-remorques de 100 tonnes, suivit cette route.

En plus de l'aménagement d'une centrale, une ville nouvelle a été inscrite sur la carte du Canada. Labrieville, ainsi nommée en l'honneur de Mgr A.-N. Labrie, alors évêque du Golfe Saint-Laurent, a été construite pour loger le personnel permanent de Bersimis I et de Bersimis II. Très joliment conçue et occupant un site agréable au fond d'une

Unloading equipment at the Hydro-Quebec wharf at Forestville. These enormous pieces of equipment must now start on their final journey up the road through the forest to Bersimis II.

L'équipement de transbordement au quai de l'Hydro-Québec à Forestville. Ces énormes pièces de machinerie doivent partir de là, par route à travers la forêt, pour leur trajet final jusqu'à Bersimis II.

Staff residences at Labrieville with some of the temporary buildings in the background.

Les logements du personnel à Labrieville; à l'arrière plan quelques-unes des bâtisses temporaires.

The Inn at Labrieville, beautifully situated on the bank of the Bersimis River.

L'Hôtellerie de Labrieville, joliment située sur la rive de la rivière Bersimis.

the valley, Labrieville is a jewel set in the ruggedness of wild country. Viewed from the tops of the surrounding hills this lovely little town, its brilliant green swatches of lawn contrasting vividly with the stern grandeur of the neighbouring country, inspires envy of its inhabitants in one condemned to the urban monotony of metropolitan employment.

Lacking nothing in the way of comfort for its people, the town has been carefully planned to counteract the isolation that might be felt by the

vallée, Labrieville est un véritable joyau enchâssé dans la rugosité d'un pays inculte. Aperçue du sommet des montagnes qui l'entourent, cette gentille petite ville, avec ses parterres dont le vert brillant contraste vivement avec l'austérité impressionnante du paysage environnant, ne peut qu'inspirer de l'envi à l'habitant des régions urbaines.

Ne manquant de rien pour assurer le confort de ses habitants, la ville a été conçue de manière à pallier la sensation d'isolement qui pourrait s'em-

A pupil receiving advice on book selection in the school library at Labrieville.

Une écolière reçoit des conseils sur le choix de livres à la bibliothèque de l'école de Labrieville.

families of operating personnel. A single group of buildings combines shopping and indoor recreational centres under one roof. Besides the neat rows of comfortable homes, the town contains a baseball park, curling and skating rinks, tennis courts, swimming pool and boating dock; all dominated by a very beautiful little church. A visit to the excellently run school quickly gives the impression that, apart from the more normal three Rs, the children are being given an invaluable education in citizenship, courtesy, discipline and self-respect. Educationists could well profit from contact with the happy and efficient atmosphere of the Labrieville school.

Situated as it is in the heart of the wilderness, Labrieville is a sportsman's paradise where fish, moose, bear and a host of other game creatures abound.

But primarily, the town impresses the observer as a tremendous tribute to the foresight of Hydro-Quebec in showing how Canada can be developed for its people in step with the exploitation of its natural resources.

Within two months of the start of work on the project, surveys had provided enough information for the engineers to draft a preliminary construction schedule. In less than a year, the old generating station at St. Timothee had been dismantled, moved to Bersimis and installed in a temporary power house at Lac Cassé to provide 15,000

parer des familles. Un immeuble loge sous un même toit le centre d'achat et le centre récréatif. A côté des rangées de maisons confortables et proprettes, il y a un parc pour les jeux de balle, une patinoire, un curling, des courts de tennis, une piscine, un abri pour embarcations, le tout dominé par une très jolie petite église. L'école est dirigée d'une manière remarquable par les Soeurs Servantes du Saint Coeur de Marie et une visite y donne rapidement l'impression qu'au stade du cours primaire les élèves acquièrent, en plus d'une connaissance des matières ordinaires, une inestimable formation en civisme, en courtoisie, en discipline et en fierté. Le climat de satisfaction et d'efficacité qui y règne est à donner en exemple.

Située au coeur d'une région inhabitée, Labrieville est un véritable paradis pour les sportifs; on y trouve en abondance du poisson, l'orignal, l'ours et nombre d'autres animaux sauvages.

Cette ville témoigne de la prévoyance de l'Hydro-Québec qui a montré comment le Canada peut être développé au bénéfice de sa population grâce à l'exploitation de ses ressources naturelles.

Moins de deux mois après le début de l'entreprise, les relevés avaient donné suffisamment de renseignements pour permettre aux ingénieurs d'établir les grandes lignes des travaux à accomplir. En moins d'un an, la vieille centrale de St-Timothée était démontée, transportée et remontée au lac Cassé, pour alimenter les chantiers en élec-

The simple, but beautiful, church reflects the quiet peace of the town in the wilderness.

L'église, splendide dans sa simplicité, symbolise la paix et le calme de cette ville sise en pleine région sauvage.

The eight 150,000 horsepower generators deep inside the mountain at Bersimis I.

Les huit génératrices de 150,000 chevaux enfouies au sein de la montagne à Bersimis I.

horsepower for construction purposes. The Forestville wharf was built and operating in less than six months; the thousands of workers were comfortably installed in three construction camps which had been built in addition to the main camp at Labrieville. Access roads to the work sites had been established and work had been started on the construction of the 400-mile-long transmission line to Montreal, the latter task involving the clearing of some fifteen thousand acres of brush in almost impenetrable country.

The Bersimis River empties into the St. Lawrence almost 200 miles below the city of Quebec. The old name of Betsiamites is a Montagnais word meaning "the assembly place of the lampreys" — a name which must now bring horror to the Great Lakes fishermen! The watershed of the river lies between the Saguenay River system and the Outardes River watershed. Between Lake Pipmuacan and the mouth of the river, a distance of about a hundred miles, the river falls 1,225 feet. Over a stretch of twenty miles below Lac Cassé, it falls more than 700 feet down a series of falls and rapids to provide the most suitable head for development. A further drop of 370 feet occurs in the next twenty miles and ends forty-five miles from the mouth of the river.

Studies showed that the potential of the river could be developed most economically by building two rock-fill dams at the outlets of Lac Cassé to impound the water at 1,300 feet above sea level.

tricité avec sa puissance de 15,000 chevaux. Le quai de Forestville était mis en opération en moins de six mois et des milliers d'ouvriers étaient confortablement installés dans trois chantiers qu'on avait aménagés en plus du chantier principal à Labrieville. On avait commencé la construction d'une ligne de transmission de 400 milles de long jusqu'à Montréal, ce qui exigeait le défrichement de quelques 15,000 acres de forêt dans des régions presque impénétrables.

La rivière Bersimis se déverse dans le Saint-Laurent à près de 200 milles en aval de Québec. Le vieux mot Betsiamites est d'origine montagnaise et signifie "l'endroit où les lamproies se réunissent", nom sans doute horrible aux oreilles des pêcheurs actuels des Grands Lacs! Le bassin hydrographique de cette rivière se situe entre ceux de la rivière Saguenay et de la rivière aux Outardes.

Entre le lac Pipmouacan et l'embouchure de la rivière, une distance d'une centaine de milles, la différence de niveau est de 1,225 pieds. Dans les vingt premiers milles après le lac Cassé, la rivière, en une succession de chutes et de rapides, s'abaisse de plus de 700 pieds, ce qui convient particulièrement bien à un aménagement hydroélectrique. Une autre dénivellation de 370 pieds survient dans les 20 milles suivants, et s'achève à 45 milles de l'embouchure de la rivière.

Les relevés ont démontré qu'il était possible d'augmenter très économiquement le potentiel du réservoir en construisant deux barrages de roche

The impounded water would be directed through a tunnel driven across a bend in the river to an underground power house where the water would be discharged from the turbines at a level of 425 feet.

This work backed up water into Lake Pipmuacan, creating a body of water 290 square miles in area. Two smaller cut-off dams were required at the western end of the reservoir to prevent spilling into the Péribonca and Shipshaw watersheds.

The main dam on the Bersimis River is 2,200 feet long at the crest, 200 feet high and 900 feet wide at the base, and is located a short distance up-stream from Lac Cassé Falls. The Desroches River is cut off by a similar, but smaller, dam. A mountain between the two dams was cut down to form a spillway for the reservoir. These two dams are similar in construction to the Kenney dam of the Aluminum Company of Canada Kemano development in British Columbia.

A tunnel, 1,050 feet long, 39 feet wide and 36 feet high, was driven 100 feet below the river-bed to carry the river during construction so that work could be carried out "in the dry". This tunnel also fed the 15,000-horsepower plant erected to supply power during construction operations.

To obtain the maximum benefit from the falls below Lac Cassé, a 31-foot diameter, concrete-

et de terre aux deux déversoirs du lac Cassé pour y élever le niveau de l'eau à 1,300 pieds au-dessus de la mer. L'eau ainsi accumulée devait couler par un tunnel vers les turbines d'une centrale souterraine située à 425 pieds au-dessus du niveau de la mer.

Ces deux barrages eurent pour effet de refouler l'eau jusqu'au lac Pipmouacan et de créer un réservoir de 290 milles carrés. Il fallut construire deux autres petits barrages à l'extrémité ouest de la nappe d'eau pour empêcher celle-ci de s'écouler dans les rivières Péribonca et Shipshaw.

Le barrage principal sur la rivière Bersimis, situé en amont près de la chute du lac Cassé, mesure 200 pieds de hauteur, 2,200 pieds de longueur et 900 pieds d'épaisseur à la base. La rivière Desroches est aussi séparée du lac Cassé par un barrage semblable, mais moins long. Une montagne, qui séparait les deux rivières, a été nivelée pour établir un déversoir. Par leur construction, ces barrages sont semblables au barrage Kenney de l'aménagement Kémano réalisé par l'Aluminum Co. of Canada, en Colombie Britannique.

Afin de procéder aux travaux à pieds secs, on perça un tunnel de dérivation de 1,050 pieds de long, de 39 pieds de large et de 36 pieds de haut à une centaine de pieds sous la rivière. Ce tunnel a aussi servi à capter l'eau nécessaire à l'exploitation de la centrale provisoire de 15,000 chevaux

After passing through the turbines, the water is discharged into this 75 ft. deep underground tailrace.

Après leur passage dans les turbines les eaux sont déversées dans ce canal de fuite de 75 pieds de profondeur.

The control room at the Bersimis I Generating Station, nerve centre of the development.

La chambre des contrôles à la centrale Bersimis I, centre nerveux de l'aménagement hydro-électrique.

lined tunnel was driven seven and a half miles through mountains to carry the water under controlled conditions to the main power house. Work on the tunnel was carried out at an average speed of 732 feet per week through the solid granite of the mountain to terminate in a 31-foot-diameter manifold above the power house. From this manifold branch off the eight penstocks, or individual supply tubes leading to the turbines.

In a hydraulic power development operating under a high head of water, sudden closure of the gates which cut off the water supply to the turbines — as may happen during an emergency — produces a severe pressure wave in the system. This can cause serious damage to the machinery and precautionary steps are taken by installing a surge tank which absorbs the water momentum and prevents damage.

At Bersimis I, the surge tank is carved from rock and is an engineering feat in itself. About 60 feet up-stream from the first penstock, a 27-foot-diameter shaft rises vertically 313 feet from the tunnel to the bottom of the surge tank. The tank is 84 feet in diameter and 360 feet deep, and opens on to a hilltop overlooking the town of Labrieville. During construction a 10-foot pilot shaft was drilled upward 680 feet from the main power tunnel to ground level on top of the hill. When this was completed, rock excavation was started from the top and the rubble removed was

pour alimenter le chantier en électricité.

Pour obtenir le rendement maximum de la chute du lac Cassé, on perça, sur une distance de 7½ milles, un tunnel renforcé de béton de 31 pieds de diamètre, destiné à emmener l'eau jusqu'à la centrale et à en contrôler le volume. La vitesse moyenne de percement de ce tunnel dans le granit solide de la montagne fut de 732 pieds par semaine. La galerie aboutit à une culotte de 31 pieds de diamètre d'où l'on a fait partir les huit tubes d'amenée pour diriger l'eau vers autant de générateurs.

Dans le cas d'un aménagement hydro-électrique où la hauteur de chute est très élevée, la fermeture subite des valves d'arrivée de l'eau — comme cela peut être nécessaire dans les circonstances critiques — peut créer des pressions considérables et ainsi causer des dommages sérieux à la machinerie. On évite ce danger en construisant une cheminée d'équilibre pour absorber le choc de l'eau subitement arrêtée dans sa course et ainsi éliminer le risque de dommages.

A Bersimis I, la cheminée d'équilibre, percée en plein roc, est une oeuvre de génie remarquable. Situé à 60 pieds en amont du premier tube d'amenée, un puits de 27 pieds de diamètre s'élève verticalement, à 313 pieds de hauteur, du tunnel à la partie inférieure de la cheminée d'équilibre. Celle-ci a un diamètre de 84 pieds et 360 pieds de hauteur. Elle débouche en plein air au sommet de la montagne qui domine Labrieville. Pour

dropped down the vertical pilot shaft to be hauled out by truck from the power tunnel far below.

Because of space limitations at the site, it was decided to carve the power house into the interior of the mountain. Access is through a 270-foot-long tunnel, 36 feet wide and 30 feet high, leading to the main cavern which is 565 feet long, 65 feet wide and 80 feet high. Eight Francis-type turbines of 150,000 horsepower each drive 13,800-volt generators rated at 138,000 kva.

Parallel to the power house is a tailrace chamber into which the water is discharged after passing through the turbines. From here the water is returned through a tailrace tunnel to the river channel below the power house. An emergency tunnel is provided for exit purposes and a 20-foot-wide tunnel connects the power house to the control building in the switchyard outside the mountain. The control building houses all control equipment and provides office facilities. This three-storey building also serves as headquarters for the municipal administration of Labrieville.

Bus bars, or short conductors, are installed in separate tunnels to carry the power from each generator to its relevant transformers where the voltage is increased to 300,000 volts for transmission to Quebec and Montreal and to Gaspé, the latter by way of a submarine cable.

Between the main dam and the Bersimis I tailrace, only water that is surplus to power requirements is allowed to flow in the normal channel of the river and so the level of the river above Labrieville varies with the amount of water needed to drive the machines and with the level in the reservoir. When the water in the reservoir is low, none is permitted to flow down the river course; all flow from the watershed is stored behind the dams until the normal level is reached. As the level in the storage area rises to the maximum, a gate in the dam is opened to spill excess flow down into the river-bed. In the event of severe flooding, the excess water can spill over the uncontrolled spillway between the two dams.

The introduction of water to the river channel as the gate in the dam is opened is a spectacular sight. As the gate lifts, first a trickle of water runs over the dry rocks of the ancient falls. This rises to a rush and then becomes a foaming torrent

accomplir ce travail, on a d'abord percé de bas en haut, jusqu'au sommet de la montagne, un puits de 10 pieds de diamètre. Ensuite, on a élargi à partir du sommet en laissant tomber la roche brisée dans le fond d'où celle-ci était transportée à l'extérieur au moyen de camions.

Pour des raisons pratiques on a construit la centrale à l'intérieur de la montagne. On y accède par un tunnel de 270 pieds de long, de 36 pieds de largeur et de 30 pieds de haut. La caverne de la centrale mesure 565 pieds de long, 65 pieds de large et 80 pieds de haut. Huit turbines de type Francis d'une puissance de 150,000 chevaux chacune y sont installées. La tension à la production est de 13,800 volts et les alternateurs ont une puissance de 138,000 kVa.

Le canal de fuite est constitué à une extrémité par une immense caverne souterraine; à l'autre, il se continue par un tunnel et une section en plein air qui débouche sur la rivière. Pour évacuer rapidement le personnel en cas de besoin, on a percé un tunnel de 20 pieds de large entre la centrale et l'immeuble de la chambre de contrôle du poste de départ, à l'extérieur. Cet immeuble de trois étages loge aussi les bureaux administratifs, tant des centrales que de Labrieville.

Les huits barres omnibus sortent de la centrale

Last minute check on a speed governor before starting up one of the giant machines at Bersimis II for the first time.

Dernière vérification d'un contrôle de vitesse avant la mise en marche initiale d'une des machines géantes à Bersimis II.

The huge bucket used for pouring concrete at Bersimis II approaches the dam with another tremendous load of concrete.

L'immense baquet employé pour la coulée à Bersimis II s'approche une fois de plus du barrage avec son énorme charge de béton.

which obliterates the rocks in a wild chaos of tossing spray and swirling spume. Before one's eyes the Falls of Lac Cassé are reborn from the shapeless piles of rock. After watching the birth of a waterfall, the visitor can leave the dam by car and drive down to Labrieville in time to see the surge of water arrive down-stream after it has made its much longer journey around the old bend in the river.

Bersimis II

Below Labrieville, the river assumes its old proportions because the water diverted through the turbines by way of the tunnel is returned to take its natural route to the St. Lawrence. The river is, in fact, much more beautiful than of old. Its flow is now controlled and remains constant throughout the year. Thanks to the storage behind the dams, the days of rushing spring torrents and puny drought-time trickles are gone.

Advantage is again taken of the constant flow of water that now courses down the next twenty miles of the river with a 370-foot drop over falls and rapids. The water that has already made its journey through the seven-and-a-half-mile tunnel at Bersimis I will soon be impounded again at Bersimis II to be diverted through another tunnel to provide a further 900,000 horsepower of useful energy from five turbines.

par de petits tunnels, transmettant l'énergie produite par chaque groupe générateur aux transformateurs qui en élevent la tension à 300,000 volts pour la transmettre à Québec et à Montréal, ainsi qu'en Gaspésie par voie de câbles sous-marins.

Dans la section de la rivière entre le lac Cassé et le canal de fuite de la centrale, l'eau ne coule que lorsqu'il y a surplus dans le réservoir. Aussi cette section de la rivière est-elle à sec tant que le niveau requis derrière les barrages ne dépasse pas la cote fixée. Lorsqu'elle atteint ce maximum, une vanne du barrage est ouverte pour laisser écouler le surplus. S'il y avait un surplus d'eau tel que l'ouverture de la vanne ne suffisait pas, il pourrait s'écouler par le déversoir entre les deux barrages.

C'est une scène vraiment spectaculaire que d'assister à l'ouverture de la vanne. D'abord, c'est un filet d'eau qui tombe sur les roches asséchées de l'ancienne chute. Puis le filet grossit pour se transformer bientôt en un véritable torrent qui bondit entre les roches — contre lesquelles il se pulvérise en formant des remous d'écume. Ainsi, à travers les amoncellements de roc, on voit pour ainsi dire renaître la chute d'autrefois. Et il est alors possible au visiteur de retourner en automobile jusqu'à Labrieville, à temps pour assister à l'arrivée du torrent qui a dû faire un long détour par l'ancien coude de la rivière pour arriver jusque là.

Bersimis II

En aval de Labrieville, la rivière a gardé son aspect d'autrefois car l'eau, qui a d'abord été détournée vers les turbines, a été ensuite retournée à son cours normal vers le Saint-Laurent. En fait, la rivière y est maintenant plus belle qu'autrefois, car son cours est maintenant sous contrôle toute l'année durant. Grâce aux barrages, les torrents du printemps et les filets d'eau de la saison sèche sont devenus choses du passé.

De nouveau, on profite du débit constant de la rivière et de la dénivellation de 370 pieds qu'elle subit dans les 20 milles après la première centrale. L'eau, après avoir franchi le tunnel de 7½ milles de Bersimis I, sera de nouveau endiguée à Bersimis II où, dirigée encore une fois dans une galerie, elle fera tourner cinq autres turbines d'une puissance totale de 900,000 chevaux.

At the site chosen for Bersimis II, very high rocky banks lend themselves admirably to the construction of a concrete, gravity-type dam which backs up the river between its steep banks to the Bersimis I tailrace and creates a new storage area with a head of some 386 feet. This reservoir of power will create two and a half billions of kilowatt-hours annually to feed the constantly hungry power systems of the province.

The concrete dam rises to a height of 276 feet above the bed of the river and is 2,100 feet long, 310 feet thick at the base and 14 feet wide at the top. Six gates built into the dam enable flood water in excess of requirements to be spilled at the rate of 130,000 cubic feet per second — almost 3,600 tons of water each second. To allow work to proceed on the dam, a temporary tunnel was drilled to carry the flow of the river past the site until construction was finished.

Two additional dams of earth, with clay cores, were constructed to close off two outlying valleys through which water from the storage area would have escaped. To prevent damage from the action of waves, the faces of these dams were rip-rapped,

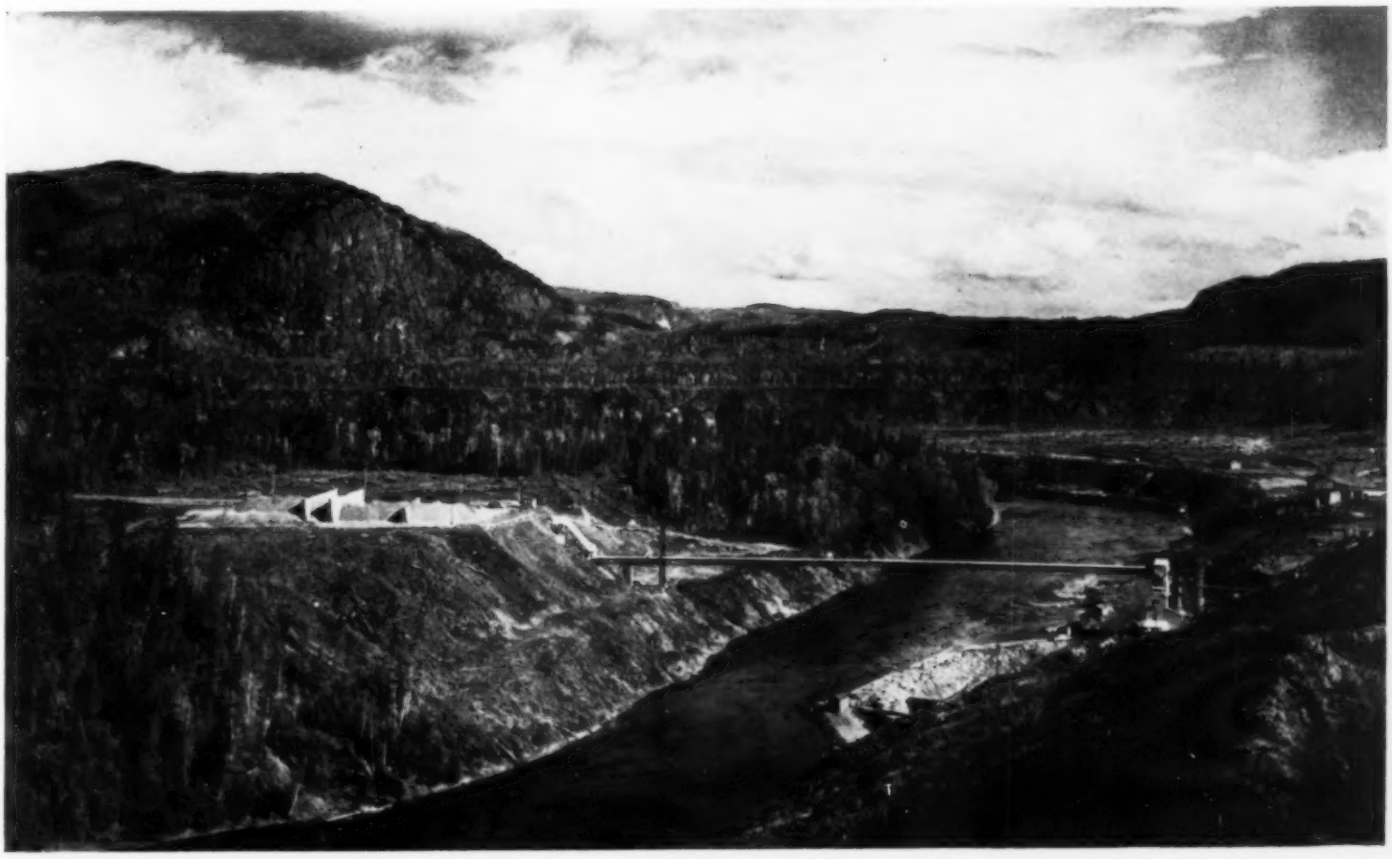
A cause des murailles rocheuses qui l'entourent, le site de Bersimis II se prêtait admirablement bien à la construction d'un barrage-poids déversoir en béton destiné à maintenir l'eau au niveau du canal de fuite de Bersimis I et à créer ainsi un nouveau réservoir assurant une hauteur de chute de 386 pieds. Ceci permettra une augmentation annuelle de 2½ milliards de kilowattheures pour répondre à la demande croissante d'énergie dans la province.

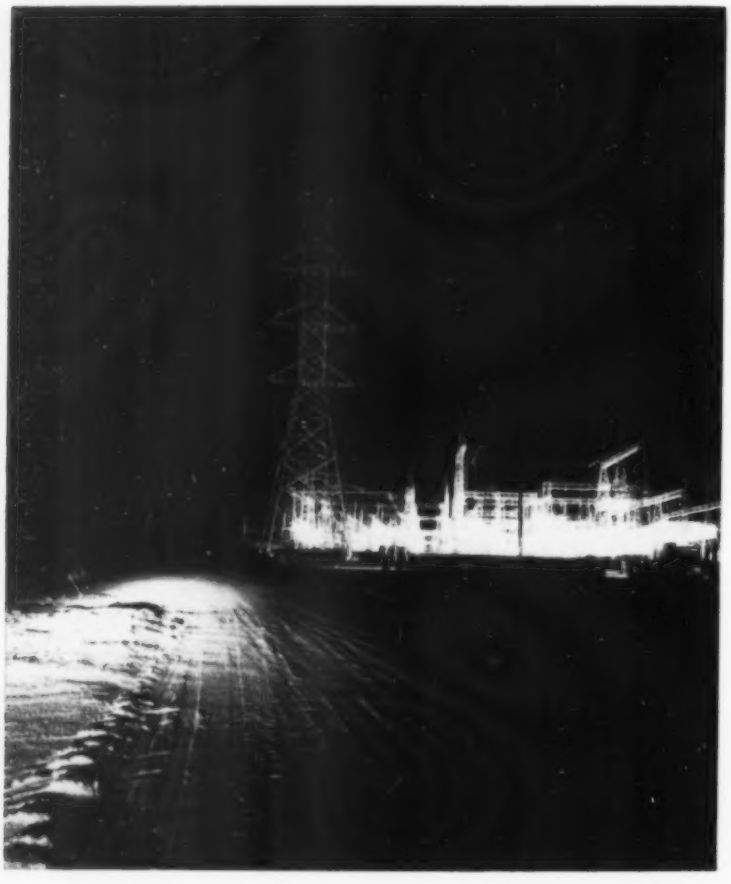
Le barrage de béton s'élève à 276 pieds au-dessus du lit de la rivière et mesure 2,100 pieds de longueur, 310 pieds d'épaisseur à sa base et 14 pieds de largeur à son sommet. Les six vannes, prévues pour l'écoulement des eaux de surplus ont une capacité de déversement de 130,000 pieds cubes, presque 3,600 tonnes d'eau, à la seconde. On avait, pour faciliter les travaux de construction, forer un tunnel temporaire pour détourner le cours de la rivière.

Deux autres barrages de terre, imperméabilisés avec de l'argile, ont été construits de façon à bloquer le passage des eaux endiguées vers deux vallées adjacentes. On a pris soin de les protéger

Crushed rock from the quarry is carried across the river to the batching plant on this conveyor at Bersimis II.

Au-dessus de la rivière, le convoyeur qui transporte la pierre concassée de la carrière à la station de malaxage à Bersimis II.





At work on the tunnel lining at Bersimis II.

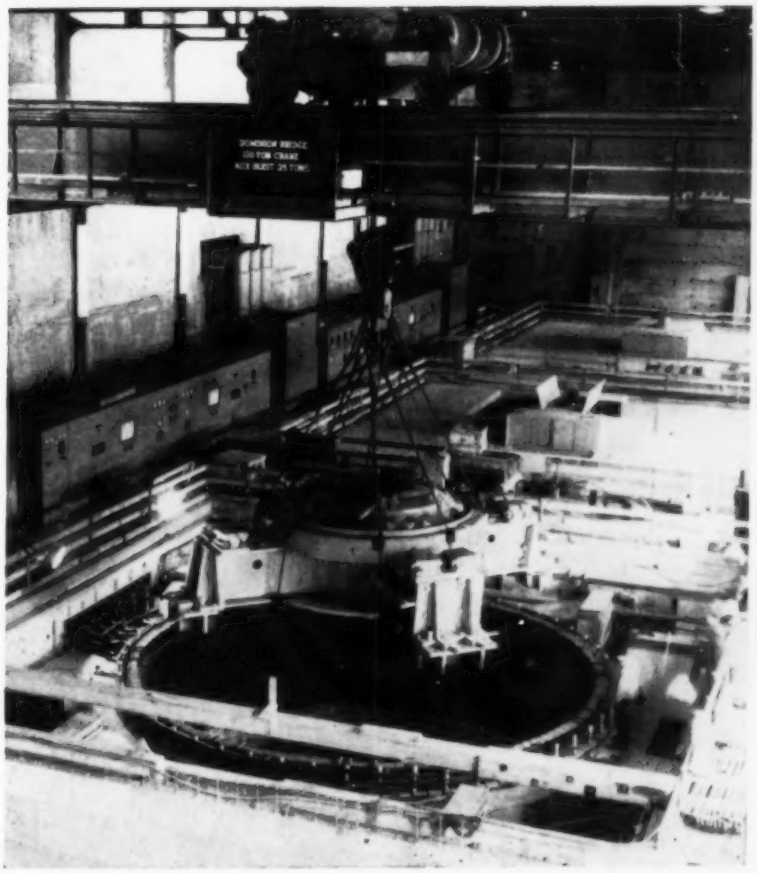
Travaux de revêtement du tunnel à Bersimis II.

The Labrieville switchyard at night.

Cour de relais et interrupteurs de Labrieville, vue de nuit.

The main dam at Bersimis II as it nears completion.

Le barrage principal de Bersimis II à la veille d'être terminé.



Installation of one of the five 180,000 horsepower turbines in the powerhouse at Bersimis II.

Le montage d'une des cinq turbines de 180,000 chevaux à la centrale Bersimis II.

or covered with rocks to prevent erosion. An intake, built into the face of the rock on the north bank of the river, admits water to a 38-foot-diameter tunnel, 800 yards long. The tunnel terminates in five penstocks which will guide the immense force of the water to enormous 171,000 horsepower Francis-type turbines to drive five 120,000 kva. generators.

Unlike Bersimis I, the power house at the second development is in the open on the north bank. The power house, which incorporates an assembly hall and a control room, is built of prefabricated insulated panels of aluminum sheet and presents a pleasing appearance.

Power from Bersimis II is flowing through the transmission lines; the first three units are now operating, and a new chapter has been written in the saga of a utility that has grown from a newly created organization in 1943 to become one of the giants of the industry. Soon all five units will be adding their quota of power to the further development of Quebec and of Canada. The unknown stream of a few years ago has become a familiar name to engineers throughout the world. The words of General McNaughton, Chairman of the Canadian Section of the International Joint Commission, summed up the achievement as follows:

"In the estimates of possible hydro-electric developments on rivers flowing from the Labrador Plateau to the St. Lawrence which were given a few years ago, the potentialities of the Bersimis were stated as about 500,000 horsepower. Compare this figure with the 1,200,000 horsepower actually provided at Bersimis I, to which will be added at the number II plant some 900,000 horsepower, making a total of over 2,000,000 horsepower.

"These figures well illustrate two important facts, of which Bersimis is only one of many examples. The first is the very large and important key resource in hydro-electric power with which Quebec is endowed in the lower St. Lawrence where there is convenient access to ocean transportation and the markets of the world. The second fact evident is that the responsible engineers of Hydro-Quebec, by the exercise of the highest art in the utilization of available levels and flows, have, in the result, drawn an almost incredible advantage from these resources for the economic benefit of the people of Quebec and Canada.

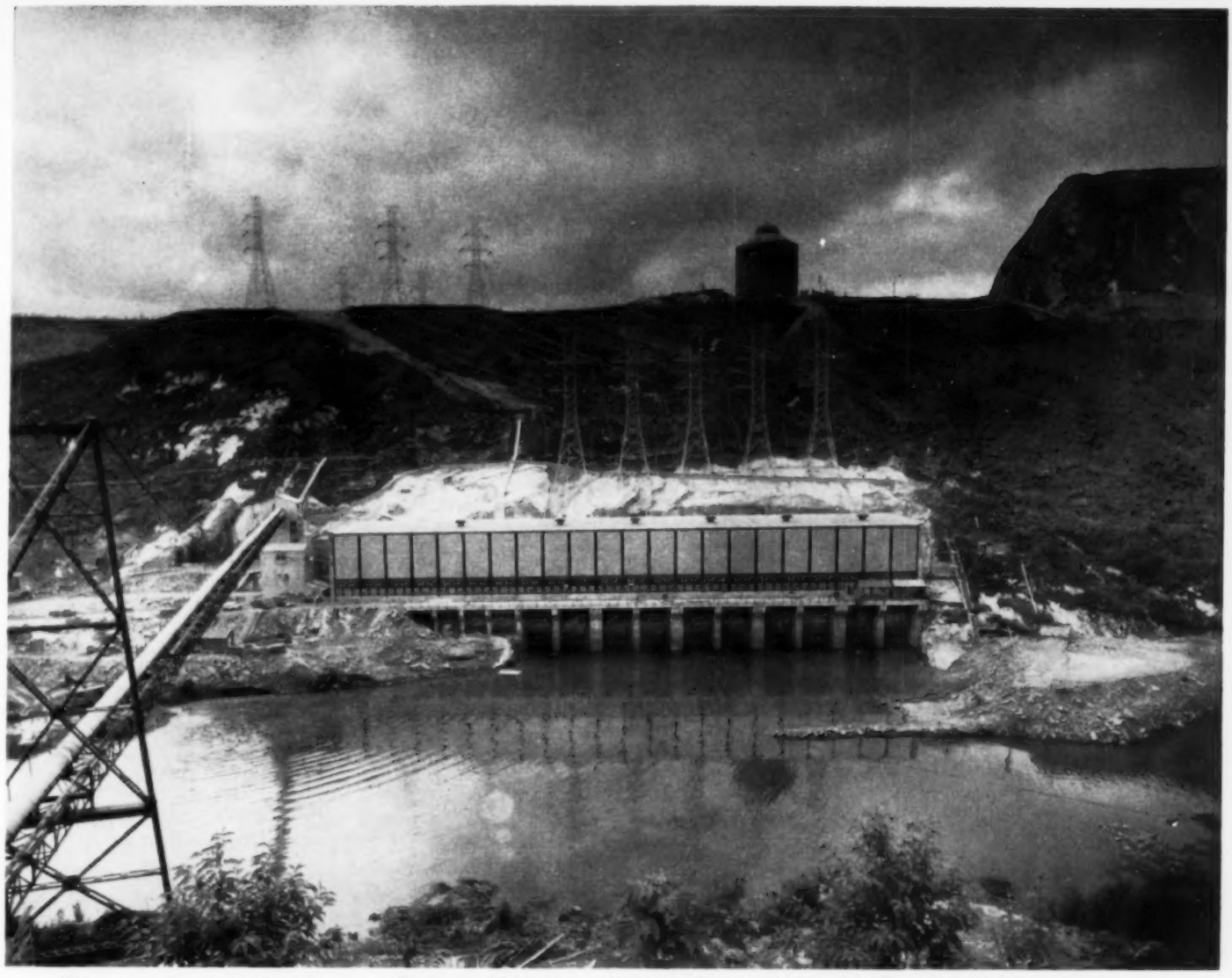
contre les dangers d'érosion en les couvrant de pierres. Construite sur la rive droite de la rivière, une prise d'eau amène celle-ci dans un tunnel de 38 pieds de diamètre et de 800 verges de longueur. Ce dernier aboutit à cinq tubes d'amenée qui dirigent l'eau vers autant de turbines de type Francis d'une puissance de 171,000 chevaux actionnant des groupes générateurs de 120,000 kVa.

Là, contrairement à Bersimis I, la centrale est installée en plein air. Elle comprend une salle de réunion et une chambre de contrôle. D'architecture agréable, elle est construite de panneaux préfabriqués d'aluminium ayant subis un traitement pour les rendre isolants.

L'énergie produite à Bersimis II depuis novembre dernier — alors que deux groupes générateurs sont entrés en exploitation — parcourt maintenant les lignes de transmission, ajoutant ainsi un nouveau chapitre à l'histoire fabuleuse d'un service d'utilité publique créé en 1943 et qui, depuis, est devenu un géant de l'industrie. Bientôt, les cinq générateurs seront en marche et ajouteront ainsi aux progrès du Québec et du Canada. La rivière, inconnue il y a quelques années, est maintenant un nom familier aux ingénieurs du monde entier. Le général McNaughton, président de la Section canadienne de la Commission internationale des eaux limitrophes, a bien résumé cette réalisation:

"Il y a quelques années," disait-il, "à la suite de l'évaluation du potentiel hydroélectrique des rivières qui prennent naissance sur le plateau du Labrador et s'écoulent dans le Saint-Laurent, on cotait le potentiel de la Bersimis à 500,000 chevaux. Comparez ce chiffre aux 1,200,000 chevaux de Bersimis I, et aux 900,000 chevaux de Bersimis II qui s'y ajouteront bientôt pour donner le total de plus de 2,000,000 de chevaux.

"Ces chiffres illustrent deux faits importants et de ceci Bersimis n'est qu'un exemple parmi d'autres. Le premier, c'est que cette partie du Québec, située du côté nord du bas Saint-Laurent, est dotée de très considérables ressources hydroélectriques, en une région facile d'accès aux transports océaniques et donc aux grands marchés du monde. Le second, c'est que les ingénieurs de l'Hydro-Québec ont atteint le summum de leur art en utilisant au maximum les hauteurs de chute et le volume d'eau disponible, tirant ainsi avantage de ces ressources à un degré quasi incroyable pour le plus grand bénéfice de l'économie du Québec et du Canada.



The powerhouse and tailrace at Bersimis II overlooked by the surge tank on the hill above.

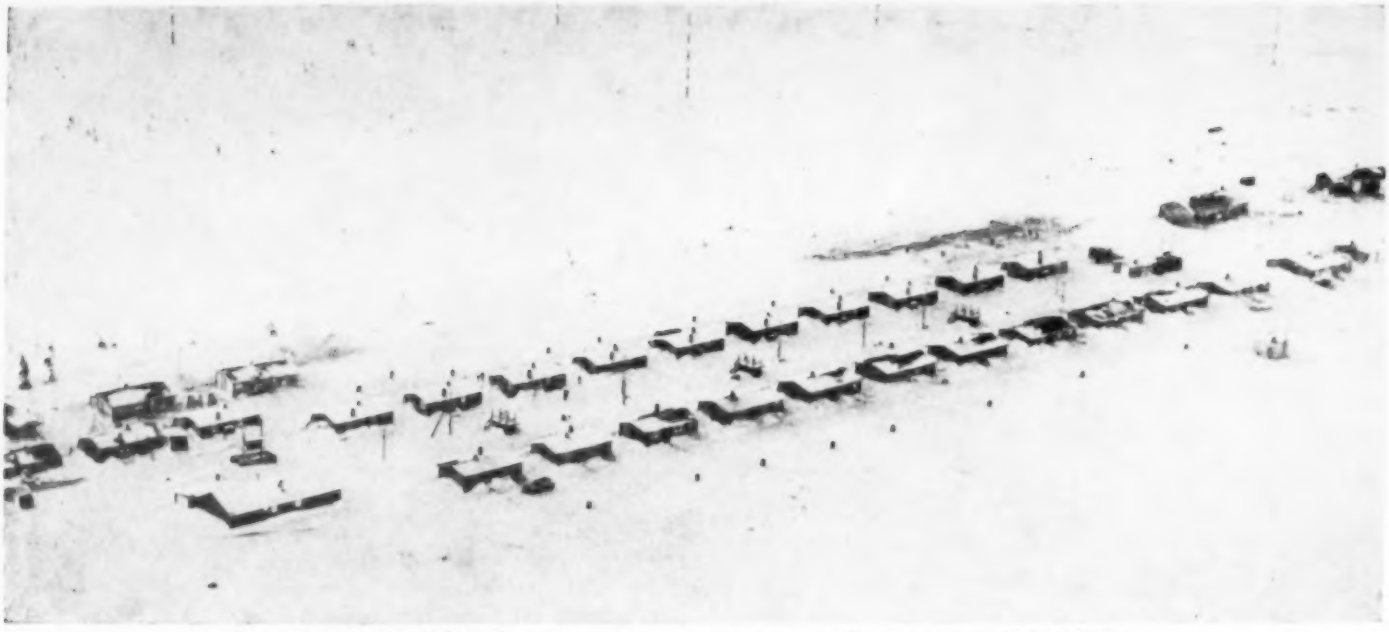
La centrale et le déversoir à Bersimis II, dominés par la cheminée d'équilibre sur les hauteurs de l'arrière-plan.

"I express my admiration of the vision and the skill which they have applied and of the determination and vigour with which their plans are being driven to completion . . ."

Hydro-Quebec is already looking ahead to further conquests. The waters of the Manicouagan system have the stupendous potential of six million horsepower, but to realize this potential poses equally stupendous problems. However Bersimis has shown that these problems can be overcome.

"Je tiens à exprimer mon admiration pour leur imagination et leur habileté ainsi que pour la détermination et la vigueur avec lesquelles leurs plans sont mis à exécution."

L'Hydro-Québec vise à de nouvelles conquêtes, au nombre desquelles on compte la Manicouagan avec son formidable potentiel de six millions de chevaux. Ce projet aussi soulèvera de formidables problèmes — mais la réalisation de Bersimis a démontré que de tels problèmes ne sont pas insolubles.



From the air Akudlik in the winter presents a geometrical pattern on a field of white.

Akudlik—The Place Between

by R. A. J. PHILLIPS

Photographs by A. E. Scott, except where credited.

In the 340 years since its first discovery by a European, Churchill, Manitoba, has been tracked by history. It was a brooding outpost of power for the rival empires of London and Paris. When its military history had been written — scarcely in terms of strategic brilliance or of undue gallantry — it became for two centuries the centre of exploration for much of Canada's Worth. And when the maps were made, and the heroes had departed, it became a seaport, and a strange intrusion into the Arctic of the communications network of industrial Canada.

Six years ago the writing began again on yet another page of Churchill's history. That was the beginning of Akudlik, and the time has come to see how the story is unfolding.

Akudlik is a cluster of buildings, an experiment, an idea, an ideal. It was the place to which forty-two Eskimos came from the edge of destitution, from across the waters of Hudson Bay at Fort Chimo in Ungava. It was a hope for them, and for the Department of Northern Affairs which sponsored the project — a hope for a better life in which the outworn traditions of the centuries would be gambled against the possible rewards that could be wrested from the new civilization of the white man. It was the first occasion when an organized attempt was made to see how a group of relatively primitive Eskimo people would fit into our urban society. It was a people with no education, no training, no knowledge of the English language, and only slight contact with the white man through the resident trader, police and missionary. They crossed the waters to move into an urban twentieth-century life. The adult men would be taking jobs and seeking skills in fields they did not know existed. The success of the experiment would depend not only on their ability to learn their work quickly and well, but on the reputation they could make among cautious white men. It would depend on the mutual acceptance of two races, and of both the older and younger members. The success would be judged in part by what the new society thought of them, and what they thought of the new society. The final question in their minds had to be whether they would think enough of the new society to adopt it as their own.

The experiment was a total and entire success, to a degree that neither participants nor planners could have hoped. But how does one describe success?

Is it in terms of the modern cars drawn up beside trim, picture-book homes along the road to the town of Churchill? Is it in terms of the solid bank accounts? These are but

the superficial signs. You will see the success far deeper among the school children where Eskimo youngsters and their fellow citizens work and play side by side in complete acceptance. You will hear it in the dances at the military camp. You may catch a bit of it some evening in a quiet room where the older Eskimos, the almost lost generation, study English or arithmetic which they never had a chance to learn when they were young.

The experiment began in a cluster of decrepit buildings erected by the United States Army during the Second World War. These weary structures of sagging wood and tar-paper had been given no name but Camp 20, and it is thus that the Churchill project has long been known. They are almost midway between the town of Churchill, a settlement of 1,000 people, and the military establishment of Fort Churchill, three times the size. The Eskimos, with their usual ingenuity, later saw, in the location of the community as well as in its purpose, the ideal name—"The Place Between".

The other town that forms part of the story is Fort Chimo on the south-west corner of Ungava Bay in Arctic Quebec. It has long been an area of depleted game resources, its economic and social problems seriously complicated by the large United States base erected there during the war and subsequently closed. For years the people had congregated near the settlement, doing little trapping or hunting, depending on the flow of government relief to carry life from year to year. This area was, therefore, one of the first targets of the new civil administration in the Arctic shortly after the Department of Northern Affairs was established in the closing days of 1953.

To the people of Fort Chimo the Northern Affairs Officers made a proposal. Up to twenty-five jobs could be found in an entirely new life in Churchill for Chimo people who would be interested in breaking the monotonous chain of thin life from the land and the products of the dole. It would mean hard work acquiring new skills and making a total adjustment in living. No families would be allowed to come until the men had proved to themselves and their employers the workability of the project. With early success, families would be brought over in six months. All transportation would be at government expense, and those not wishing to stay would be free to return at no cost to themselves at any available opportunity.

The people talked it over and nineteen decided to accept the offer. Despite all the hurdles that lay in their path, they were a

Outside view of a standard Pan Abode house. The "interlocking log" construction can be clearly seen. The drifted snow is packed hard by the high winds.

Willie Adams, an original settler from Fort Chimo, is employed as a lineman at Fort Churchill.

Centre — Jasper spends his retirement at carving.

A job is explained in the Royal Canadian Engineers' workshop at Fort Churchill.

success with their employers from the outset. The military authorities spoke of them as first-rate workmen. They were quick to learn, and keen to learn, for a great deal was at stake. They worked in a variety of trades such as electricity, carpentry, tinsmithing, plumbing and painting. Since then the list has grown much longer. They had to master not only the job but the rudiments of English. And they had to prepare for a new kind of home life.

They were lucky in their employers in the camp, and they were lucky in their guide and counsellor at Camp 20. Bill Kerr, one of the first Northern Service Officers, was in charge. Mr. Kerr had long experience in the Arctic and an extraordinary knack for making bricks without straw. With materials and labour more often contributed through Mr. Kerr's Irish charms than through standard government appropriations, the old Camp 20 breathed a new and often strange life. Donations of odd assortments of material poured in. Some could be used, some could be made into the usable. When furniture was not available, it was made. Barracks and warehouses became homes.

All this took on an added incentive as the proven success of the early months led to plans for bringing families across. They came in the late summer of 1954 and began hammering out a new form of domesticity under the guidance of the Kerrs.

The apartments were simple, their effects spartan. They were kept ruthlessly clean by women who placed an almost higher priority on the broom than on the can opener. There were, of course, problems. One of the biggest in housekeeping was to convince the new householders that electric stoves should be turned off when a meal had been cooked. The earlier tendency was to leave them on by the week. There was also a disposition to "live better electrically" in ways that had never occurred to modern advertising promotion. Hot plates, switched on, were festooned by their cords from the ceiling in the losing war against draughts — until they were discovered.

With the firm establishment of the Akudlik project, more Chimo people decided to come across. Of the later arrivals, five re-

Pierre is employed as a carpenter at Fort Churchill.

turned in 1956, not because they found the adjustment too difficult or the rewards insufficient, but because they could not persuade the older members of their families to make the break.

In 1955 work began on the new community which in two years would see the replacement of all the old Camp 20 buildings, though even then nothing was wasted. The materials went into warehousing and the community hall. The new style was the Pan Abode house, a singularly attractive type of prefabricated unit made in British Columbia on the basis of interlocking cedar logs. Neat rows of small houses appeared in the summers of 1956 and 1957, by which time most of the residents were installed in their new homes. Now Akudlik gained an air of permanence and of confidence in the future. Rents went up for all the Eskimo families, but the idea of rent was as readily accepted as the concept of permanent homes or bank accounts or all the other paraphernalia of our material civilization.

Other buildings began to join the houses, and there is now a large and complex organization under the supervision of the present Regional Administrator, Bob Kennedy. Pride of the community is the hall, built largely from salvaged materials, jointly owned and operated by all the people at The Place Between. A transit centre became a big part of the operation long before space was properly provided for it. Churchill is the route to hospital or the path home for Eskimos of most of the central Arctic. The administrative staff at Akudlik looks after about sixty transient Eskimos each month, and far more in the months when Hudson Bay is open to shipping. These are people who formerly were left in hospital after their cures — at vast public expense — or drifted into Churchill with no one to help them.

There are also three children's receiving homes and an expanding old people's home as permanent parts of Akudlik; Eskimo men and women are employed not only as cooks and general attendants but also in supervisory capacities. These are important instruments of the new Welfare Service in making a determined effort to find satisfactory homes for children separated from their

There are facilities for carpentry and other workshop activities. Sally Tootoo

Making a parka.

Inside the Old Folks' Home and his

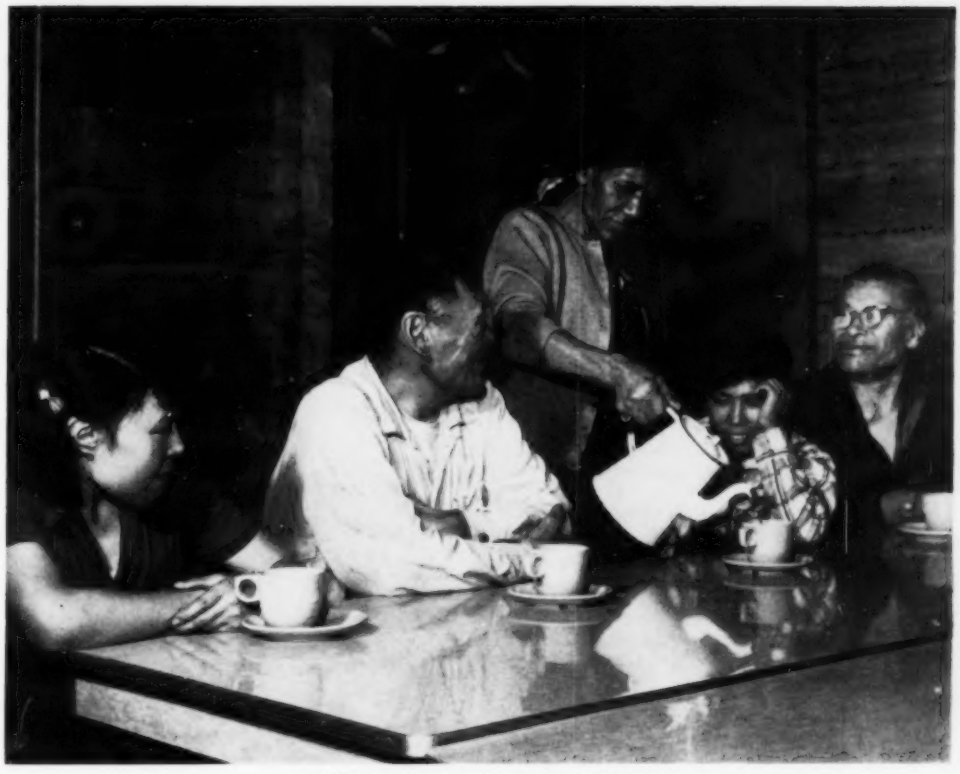
families by accident, disease or death, and for other Eskimos no longer able to withstand the rigours of the Barrens.

All this adds a good deal to the activity of Akudlik, and those who stay for any time in the centre take part in its life. The transients are given guidance and materials for the making of handicrafts. This work gives them some income, and it may help with skills which will stand them in good stead when they return home. They take part in the social life of the community. They see which parts of the white man's civilization the people of Akudlik have accepted or rejected. They glimpse something of how the problems and pitfalls have been tackled. They may view the rudiments of local government at work through the operation of Akudlik Community Club. And all this may have a very wide influence across the central Arctic.

What boy wouldn't discard his snow-shoes to inspect a jet aircraft.

The twenty-three families now permanently resident at Akudlik have come from Fort Chimo, Eskimo Point just to the north of Churchill, and from seven other communities of the eastern Arctic. Their houses are not elaborate, but they are of strikingly pleasing appearance with their exteriors and interiors of varnished logs. Most of the houses have two bedrooms, a living room, kitchen and bathroom (with running water) and a storage room. They are operated very much like houses in any Canadian suburb. The members of Akudlik among them have five refrigerators, fifteen washing machines, seven electric floor polishers, six radio-phonograph combinations, and two budgerigars. The wo-

Home and his wife Kudlooauknuk.



Coffee break in the Transit Centre.

men do most of their shopping at the stores in town. The wives, being less in contact with white people, have picked up English more slowly, and often they will use their children as interpreters when buying the family groceries. The diet is now firmly southern, though bannock is very often preferred to bread. Only occasionally are the products of fishing and hunting added. One of the Eskimos now complains that he cannot stand the smell of seal meat; when his wife makes seal stew he takes to the great outdoors.

The women of Akudlik dress well, but are more conscious of comfort than style, and have not discarded all trace of their former dress. The girls are very style-conscious, and when they buy clothing they make their own decisions, with little or no parental influence.

Eight of the women work full time, and one part time, in welfare institutions, in a down-town store, in an hotel, and as domestic help in the Army camp. The twenty-eight men of working age are all employed following trades for which they receive prevailing rates on the same basis as white men. For some, this can mean as much as $500 a month. No relief is paid at Akudlik. Some of the men are extremely skilled, though their lack of early education has remained a barrier to formal trades qualifications. One man, who started as an electrician's apprentice, is now a top-flight linesman proud of the professional reputation he has gained. He was one of the first to own a late model car, and he differed from his southern neighbours only in that it was quickly paid for. Seven others now own

Maggie is resting in the Old Folks' home while she has medical treatment and awaits completion of the new home her son is building in Grise Fiord.

Canadian and Eskimo Grade III pupils show equal interest in their art class.

Peter Tunguluk and Tommy Gordon hard at work.

Concentration and curiosity.

automobiles. Though six years ago most of them had never seen a car, they do most of their own repairs and maintenance.

On days off they may do a bit of fishing, and in summer they supplement their income by hunting white whale which they sell to the local whaling factory at a dollar a foot. Here they are taking advantage of an administrative anomaly to make the best of two worlds. The whaling industry is reserved to the native people of the North, Indian and Eskimo. The people of Akudlik qualify as Eskimos, even though they are living in a more industrial society than some of the white men of the area.

Recreation centres about the new community hall with its movies, bingo games and

School's out.

Moses and Louisa pose for the camera.

dances. A thoroughly business-like committee organizes the activities, charging admission and providing refreshments and prizes. They tackle by themselves such important policy questions as the admission of transients who do not have the same cash to spare as the employed residents. The younger set also goes to the dances in the military camp. Modern dances are now as popular as square dances. Curling has taken firm hold; two years ago Akudlik sent a team to the Winnipeg Bonspiel.

As the families of government employees, the thirty-five children of school age are enrolled in the Duke of Edinburgh School operated by the Department of National Defence in Fort Churchill. The sympathetic attitude of the military authorities and of the teaching staff has done wonders for the youngsters. The newcomers were quickly helped through the barriers of language. Now they work and play with the other pupils with little consciousness of race. Their academic record has been generally good, and sometimes outstanding. These youngsters respond well to competition of the class-room, and some will undoubtedly go on to high school. The encouragement their parents give to these ambitions is an interesting indication of their own outlooks. The older people have seen the level they can reach in the open labour market without paternalism, and they are anxious that their children be able to go even higher.

It is for these younger people, in a sense, that the whole of Akudlik is designed. If they decide to take careers in southern occupations, they will have the equipment to overcome the obstacles that bulked so large for their parents. It can be a real choice. They are still close enough to the land to know something of it. Churchill itself is at the edge of the Barrens, the centre of a continuous flow of those very close to the Arctic. They hear stories of the old life from their parents, separated from it by only a few years. But they have another window opening south.

Now that the success of Akudlik has been so firmly established, the interesting question will be the future of those who came to it and built it. Some may move on. It has now become popular to take holidays by car in southern Canada or the United States. No one has yet decided to stay "outside", but that day may come.

It will be well if some decide to move. They may choose the South, or they may go elsewhere in the Arctic where they are assured a position of leadership in the industrial developments now on the horizon. Then their places will be taken by others in the search of something better and more solid than the old land which has failed them.

Perhaps a few will choose to live in the likeness of the white man; the decision is theirs. The important change from the past is that there is now a choice. The very existence of this choice is a measure of the emancipation of Canada's Eskimos.

Many of our Arctic citizens prefer the old life, the land, but for those who seek a different path, Akudlik can show the way. Not just for those who built it, but for future generations, it may be "The Place Between".

A young citizen who faces the future confidently.
Sally Tootoo

Air view of some of the area explored by Imperial Oil in the Peace River district of northern Alberta. The area is largely muskeg and most of the surveying is done in the winter when equipment can be transported across the frozen muskeg.

Oil and Canadian Geography

Address delivered by J. R. White, President of Imperial Oil Limited, at the Society's 31st Annual General Meeting, Monday, 15 February 1960, at the National Museum, Ottawa.

Photographs by Imperial Oil

THE TOPIC "Oil and Canadian Geography" is one which would challenge the ability of a speaker and the patience of a listener. Virtually every aspect of petroleum is intimately linked with geographical problems and conditions.

So true is this that when one of my colleagues heard the title of my remarks for tonight he said, "I hope you warned them that this was going to be not one talk, but a series!"

I can, I think, relieve your minds on that score. What I plan to discuss tonight will indeed be a series—but a series of comparatively brief examples which show the bearing geography has on oil.

But first, we might have a look at the impact oil has had on geography. It is difficult to believe that the North Pole, which was not reached until this century, is now only a routine flight away from regular air bases. It is a fact that because of oil there is no longer any such thing as an inaccessible place on the face of the earth today.

The geography of daily living has also been greatly altered by petroleum. Mobility has become our way of life and it is now almost a commonplace to find a person living in one community, working in another and going to yet another for shopping or relaxation. Not only does petroleum provide the energy necessary for this mobility, but through providing the energy for earth movers and the asphalt for pavements it makes the roads which in turn make further mobility possible.

While petroleum is contributing to the expansion of cities which in Canada are expected to grow a thousand square miles in

the next twenty or twenty-five years, it could also be regarded as making new land available. As a fuel, it makes possible the opening up of land which would not yield to other methods, and through such things as the displacement of farm horses freeing pasturage for agricultural purposes further "new" land is made available. Petroleum as a base for chemicals has also had a "land-creating" function. As material for synthetic fibres, detergents and rubber, you can regard petroleum as freeing land otherwise needed for mulberry groves, palm and rubber plantations.

Whether it is providing heat and light, whether it is providing the energy to conquer distance or the chemicals to make formerly tropical industries practical in northern climes, petroleum in its finished form is almost invariably a master of geography.

Curiously enough, petroleum at the crude oil end is in quite the reverse position with respect to geography. *Crude* oil is the slave of geography.

This is not as widely understood as it might well be. I think two factors have contributed to ignorance of the way in which geography dominates the crude oil industry:

One of these is that much too generally people absorb their economics and their geography from separate sources, with the result that, although we all have a general idea that transportation adds to cost, most of us think of transport costs as an addition to the price the consumer pays. Quite commonly, of course, transport cost is a deduction from what the producer receives and this is definitely the case in connection with crude oil.

Another factor which may have obscured the ascendancy of geography over crude oil is the old "black gold" concept of crude oil. Oil may be black, but it is certainly not gold. The chief economic characteristic of gold is its great value in relation to its very small bulk. By contrast oil only has value in large quantities and in the majority of cases it is only in large quantities that it can get to market at all.

One interesting consequence of transport costs is the wide variation of prices at the well. Crude oil in western Canada sells for about $2.40 a barrel of 35 imperial gallons. Crude oil of approximately the same gravity in south-western Ontario sells for $3.00 a barrel. The difference of some 60 cents a barrel to the producer reflects the cost of

Imperial Oil geologists at work in loose shale close to the summit of a small mountain near the Liard River in northeastern British Columbia. They wear Italian alpine climbing boots for safety.

getting crude to the common market in south-western Ontario. If it were not for the large diameter pipeline, western crude could not compete in that market at all. Railway freight charges, at an estimate, would be in the neighbourhood of $3.00 a barrel to bring crude from the West to Sarnia and this would, of course, absorb the entire value of the crude at the refinery gate.

Percentagewise, the spread in natural gas prices is even more pronounced. In western Canada the price of natural gas to the producer ranges from a low of 7 cents per Mcf[1] to a high of 13½ cents. In south-western Ontario, it brings the producer 35 cents. The spread is wider for natural gas because only a quarter to a fifth as many BTU's[2] in the form of gas can be pushed through a pipe of given diameter as could be pushed through if the pipe were carrying crude oil; hence the freight penalty per unit is that much heavier.

As I mentioned, crude petroleum varies tremendously in price depending on how far away it is from a major market. A barrel of crude oil in south-western Ontario is worth a barrel and a quarter in the Prairie Provinces. A cubic foot of gas in south-western Ontario is worth nearly three cubic feet in the Canadian West. Again, if we were to find crude oil in some of the exploration work now being done in Quebec Province or the Maritimes, somewhat lower prices would prevail because at seaboard crude oil, coming by boat from the big, low-cost Venezuelan and Middle East fields, is cheaper than in Ontario.

As I implied a moment ago, geography can render some oil virtually worthless. Alberta crude might have been in some such position had it not been for the development of the large diameter crude oil pipeline. When crude was discovered at Leduc in 1947, the Canadian Prairies were an oil-deficiency area with the result that for the first year or two there was a local market for everything that could be produced. But after this first phase was over, the development of further large reserves of crude oil in the Canadian West would have been futile except for the large diameter pipeline. The growth of reserves warranted the construction of a pipeline first to the Lakehead and later through to southern Ontario.

There is no fixed formula indicating when reserves are adequate to justify a pipeline of specific size and length. What could be done in connection with the financing and building of a pipeline running from Alberta to southern Ontario would not necessarily be possible had the pipeline been going, say, to Skagway. A pipeline is not only a function of distance, it is a link between an area of supply and an area of demand.

As a result, the factors which most influence the construction of a pipeline are the size of the oil field, that is the pressure of supply, and the intensity of the demand at the other end. If the terminal is in an area such as south-western Ontario which has large refining capacity already operating, and if this terminal is not already well supplied with crude from other sources at low prices, then the conditions for building a pipeline are favourable. The pressure of supply and the attraction of demand have to be strong enough to overcome the obstacles to pipeline building. These come largely under the heading of cost. Long distances, rough terrain, shortages of steel, high interest rates and similar factors work against the construction of a pipeline, as indeed they do against the construction of anything.

But the one dominating factor, the *sine qua non* for major pipeline construction, is the existence of a sufficiently large oil reservoir. Only a really big and prolific basin will break the bonds of geography, and if you find a basin that is sufficiently large, it will break through almost any barrier.

For example, it was only a tremendously large basin, or rather series of basins, which overcame the heat and aridity of the Saudi Arabian peninsula and other areas in the Middle East. In some parts of the area, oil not only had to fight its way past current geographical barriers, but had to cope with the indirect effects of geography as reflected in local cultural patterns, some of which have been unfavourable to trade until comparatively recent times.

In contrast with these large basins there are a number of examples of smaller fields which have remained landlocked.

One of these is the Ganso Azul field in Peru. This field lies on the eastern slope of the Andes

[1] Mcf = 1000 cubic feet.
[2] BTU = British Thermal Unit.

Mountains. Consequently, if it were to market its crude in the populated centres of Peru, it would have to do so through a pipeline across one of the highest mountain ranges in the world. Since this field is not big enough to support such a line, the only way in which it could find an outlet was through a small local refinery which supplies gasoline and other oil products to the upper reaches of the Amazon River.

Turner Valley in the foothills of the Rocky Mountains is another case in point. This field at its peak was thought capable of supplying most of the crude demand in the Prairie Provinces. But although there were at times big hopes for the field and talk of a pipeline east or another one to the west, nothing more than a line covering the 40-odd miles to Calgary was the outcome, simply because the field was not large enough to support anything more extensive.

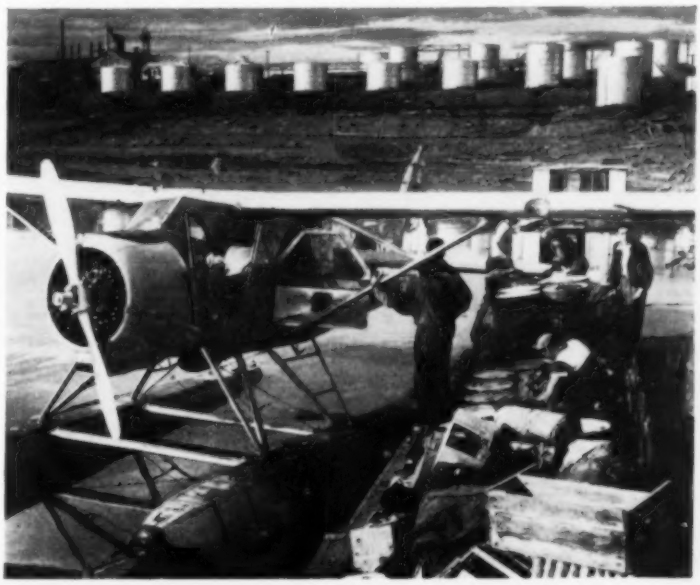
Another Canadian example is the field at Norman Wells, some eighty miles from the Arctic Circle. This field is very similar in its position to the Ganso Azul field which supplies the head waters of the Amazon. Norman Wells is equipped with a refinery of 1,350 b/d capacity. The maximum potential production rate attained by the field in war-time was in the neighbourhood of 4,300 b/d. During the war a small pipeline was built to Whitehorse where a refinery was erected. But the pipeline was only officially in operation for about a year. There was not enough local demand to justify a refinery at Whitehorse and in 1948 my company moved the plant down to Edmonton to process the crude from the newly discovered Leduc field.

The Canol experiment provided a useful case history in northern petroleum economics. Products made from Norman Wells crude and moved over the 577-mile line were refined at Whitehorse at a cost some 60 per cent higher than finished products could be imported by boat and rail. It was a convincing demonstration that, apart from war-time emergencies, where long distances are involved petroleum operations have to be carried out on a large scale or not at all. Today Norman Wells and its refinery are back to serving the local needs of the mines and river traffic in the territory.

In spring and fall Eskimo whaling boats come from far in the Arctic to fuel at Imperial's Aklavik tanks.

A geophysical exploration crew setting up a gravity-meter on the shore of the Mackenzie River, N.W.T.

Unloading supplies at Imperial Oil's refinery at Norman Wells.



Newly-developed vehicles make it possible to continue the oil search in northern muskeg country during the summer. Until recently activity was confined to winter months when the muskeg was frozen hard. Development of this broad-tracked vehicle, called the "Musk Ox", was a significant milestone because it can carry loads up to 20 tons—sufficient to take the parts of a large drilling rig. Smaller tracked vehicles are used by seismograph and geological parties. Despite their size and loads, the muskeg vehicles spread their weight over so large an area that bearing pressure is only two pounds per square inch.

The Canol and Norman Wells developments, however, have proved two things about the North which should be understood by all Canadians.

The first of these is that, contrary to widely held opinions, the problems of cold, muskeg, building on permafrost, and other factors associated with Arctic living have largely been solved. Operations in the North have been carried on successfully for at least forty years and further progress is being made in refining the art of meeting northern conditions.

The second lesson we have learned is that the problems of bulk transportation in the North are tremendous. There is a very limited local market for anything that can be produced, which means that almost everything has to be exported from the area if it is to pay out at all. And in order to be exported and meet competitive conditions in markets outside the North, commodities have to be either extremely valuable or extremely abundant—or both.

Gold mines, and similar mining operations where there is a high value per unit of product at the end, can thrive in that territory as we have seen for many years. But it is no place for a marginal operation of any sort because the transportation penalty both on goods going out and on supplies coming in squeezes to death any but the most economic operations.

Perhaps the most important thing that the people of Canada should realize more generally is that the problems and difficulties of living in the North have been greatly exaggerated. Any set of isothermal charts should

be sufficient to convince most Canadians on this point, for most of us live in an area where the extreme low temperature is well below zero and where there is at least a theoretical danger of freezing to death if you aren't careful. And careful is all one has to be in the north country. You have to be as careful as you need to be in making a winter visit to an isolated farm or cottage in, say, the Laurentians or Algonquin Park.

Basically, there is nothing about the precautions necessary for living at the 65th Parallel that one should not apply at, say, the 49th. Members of oil exploration parties or drilling crews do not leave the base without letting people know where they are going. They take an emergency kit consisting of an Arctic sleeping bag, spare food, iron rations, spare socks and mitts and a few other odds and ends. If anything goes wrong, they are expected to stay with their vehicles and not try to go anywhere on foot. This sort of precaution becomes second nature and on the whole may be less nerve-racking than attempting to cross Confusion Square in Ottawa on foot!

Incidentally, we have never yet lost a single exploration worker as a result of freezing to death and our safety record in the area is if anything rather better than elsewhere.

Comfortable housing and clothing are no longer a problem with the exception that building materials are very scarce throughout a great part of the North. There is a corresponding need for materials of a high insulating quality which are very light in weight and not too bulky to transport.

Currently we are using a type which amounts to a sandwich of plywood and styrofoam. The styrofoam filling can come in thicknesses of up to 3 inches, which we use for the floors and roofs, and from $1\frac{1}{2}$ to 2 inches for wall partitions. The panels are so light that we can get 4 or 5 three-room units on a tracked carrier. Formerly, we were only able to pack one such housing unit to a load.

Although this type of housing appeals greatly to us because it is so readily portable, it must be remembered that there are a great many other varieties of good, warm and extremely comfortable housing in use in the north country. Today, with the possible exception of entertainment—and perhaps television will one day make good this deficiency—all the amenities of city life are available in formerly isolated communities.

But if the problems of comfortable living have been largely solved, the problems of logistics certainly have not.

One of the big problems of the North is muskeg and allied to this is permafrost. The permanently frozen ground prevents adequate drainage with the result that when the surface insulating moss is scraped away in summer-time the ice melts and the road or trail tends to become a quagmire or canal. Because of this condition exploration activities by the oil industry and others were for many years confined to the winter months. For at least a quarter of a century we have known how to navigate the North in winter-time. But it is only in the last two years that we have found a device for traversing muskeg in summer-time with any degree of satisfaction.

Two types of this machine are now in production. One of them is the "musk ox", which has a capacity of twenty tons, and the other is the Nodwell Transporter, which has a capacity of ten tons. Both work on the principle of distributing weight so widely through wide tracks that the pressure on the ground of

With a fire to warm him and to keep the drilling machine working smoothly, a driller (Fred Hart) sends the bit gnawing down into the frozen ground in Alberta's Peace River area to make holes in which dynamite will be exploded. The resulting shock waves will be recorded on sensitized paper by special instruments in the recording truck.

Although temperatures range anywhere from 10 to 40 below zero, seismic crews, like this Imperial Oil party, find the going in the Peace River country and the Northwest Territories easier than in summer. The oilmen's cabins are mounted on runners and are pulled, train-fashion, to new locations by bulldozers.

the loaded vehicle never exceeds two pounds to the square inch.

These machines have, for the first time, enabled us to carry on year-round exploration for oil and gas in muskeg country, a type of ground which can be found from about the American border to well beyond the Arctic Circle. Because of the extent of the sedimentary area which is overlain by muskeg, the development of the "muskox" type of vehicle is extremely important. But its costs are also high. The cost of moving materials on this sort of vehicle is estimated to be in the order of $2.00 per ton-mile. This compares with a railway rate of around 4 to 5 cents per ton-mile, trucking costs of from 5 to 20 cents per ton-mile on highways and of 20 to 50 cents per ton-mile on winter roads. This schedule of costs appears to give the advantage to trucks. But the cost of building an access road to a drilling site can run at least $3,000 to $4,000 per mile, and when this cost is spread over the small tonnage involved, the road costs themselves can amount to $2.00 or so per ton-mile.

It perhaps goes without saying that because of these high costs on the ground, there is a school of thought which looks to the air for the ultimate solution of the transport problem in the North. This group believes that the present cost of operating a helicopter, which works out to something in the order of $4.00 per ton-mile, can be reduced substantially, and that perhaps specially designed hovercrafts or air freighters can also be developed which will bring air transportation costs down from the present level which runs anywhere from 40 cents to $1.00 per ton-mile to something around the level of ordinary trucking costs.

It is apparent here that the Federal Government "Roads to Resources" programme can prove a most constructive development. High transportation costs per ton-mile are not too onerous provided that not too many miles are involved. Consequently, a system of main government highways from which vehicles like the "muskox" could penetrate the side areas could be extremely useful. In fact the Mackenzie Highway running from Peace River to Hay River is an example of this. Since this road was built, the Alberta agricultural frontier has been pushed back 150 to 200 miles. Muskeg has not barred access to ranch country and farm land, a demonstration of the fact that the so-called wilderness can be penetrated once there is a solid base for advance.

Up to now I have been talking about

transport problems as they affect opening up the north country, transportation for exploration and for development.

Almost equally challenging is the problem that will develop if we find anything large enough to be brought out. In so far as oil is concerned, there are two main areas which pose radically different problems. The first area is the sub-Arctic, the long neck of sedimentary rocks which are favourable for oil discovery and which run between the Precambrian Shield rocks of the eastern Arctic zone and the mountains on the west. In most of this area, if large reservoirs of oil are discovered, the logical outlet would be by pipeline to the Pacific Ocean. Clearly the oil would there have to compete with tanker-borne oil from the Middle East in such markets as San Francisco, Vancouver or Japan. In the southern reaches of the prospective zone, it might be possible to tie an oil discovery into the existing pipeline system which leads to Vancouver on the west and southern Ontario on the east. One thing is obvious: oil from this area will not bring as high a price as that from the better located fields in Alberta. For this reason alone the size of any discovery will naturally be tremendously important. Location within the area will also be of considerable importance because of the wide variation in mountain terrain between the different parts of the prospective area and the Pacific Ocean.

If a discovery is made on the Arctic islands, or on the shores of the Arctic Ocean itself, a much more difficult transportation problem would have to be faced in getting the oil to market. One school of thought favours the use of nuclear-powered submarines. Obviously, however, the use of such vessels would be limited in the extremely shallow Bering Strait and parts of the Beaufort Sea in the western Arctic. More useful in the deeper waters of the eastern Arctic, the nuclear-powered submarine would still have to meet the problem of costs.

Another suggestion that seems to hold considerable merit is that there should be experimentation with super ice-breakers. This would seem desirable whether or not oil is discovered in the northern archipelago, and it might be that nuclear power would pay off more handsomely in ice-breakers than in submarines.

There is a basic similarity between the problems that will face the discoverers of oil pools in the Arctic islands and in the sub-Arctic. Both will need to find tremendously

Imperial Oil's geological parties roam the prairies from Manitoba to British Columbia and into the Northwest Territories in their search for oil. Travelling over muskeg, rivers streams and mountainous areas, the parties use every means of transportation—aircraft, helicopter, canoes, motorboats, horses and often their feet. Here a helicopter takes off after delivering supplies to a geological party in the northern Peace River area. The river is the South Nahanni and the Nahanni Butte is in the background.

large resources because it will take large reservoirs to push the oil over the geographic barriers. Both will face the problem of competing with low-cost crudes from other lands when they do reach navigable waters. Oil coming out to the Pacific Coast will meet competition of Middle East and Venezuelan crude in that ocean, while oil coming across the Pole to the British Isles or northern Europe will also face the competition of Middle East and perhaps South American crudes. In whichever direction it is to find outlet, oil from Canada's North is going to benefit comparatively little from the pull of demand, and will have to depend almost entirely on the push of supply to move it over its geographical barriers.

Such statements may appear to carry realism to the point of pessimism. Personally, I do not think so. I think that we have every ground for optimism and for congratulation on what has already been done in the North. Twenty-five years ago, with caterpillar tractors and warm-up covers for the noses of our aircraft, we licked the North in winter. In the last two years with vehicles like the "musk ox" we have mastered it in summertime. This is tremendously important, for unlike the Russians we do not have a simple problem in the North. Our North, from the point of view of oil and agriculture, consists of a narrow, waterlogged and ice-hard ditch between the Precambrian Shield and the Rockies. The Russians have a broad sedimentary plain drained by several river systems with the result that neither muskeg nor permafost are as great a problem to them.

Our answer to the problems of the North must continue to be what it has been—an answer provided by the active efforts of a great many people. We certainly need more from government because the North lacks many of the basic informational facts of life which we take for granted in southern Canada: things like the movement of the currents and the ice in the Arctic, things like the temperatures of the various lakes and hence their ability to support a fishery. We need a good deal more information on agricultural possibilities, not only in the Far North but farther south in the areas where the settlers and homesteaders are pushing back the frontiers today. We need more petroleum and mineral exploration, and if you will permit me to gnaw on an old bone of mine, I would like to suggest that if exploration is not at a satisfactory level, governments, and I don't just mean the Ottawa government, should make an objective study to see whether or not some regulation or tax ruling is not standing in the way.

The planned removal of obstacles to enterprise is possibly even more important in the North than in other parts of Canada. It is a fact, perhaps inevitably, that virtually everyone in the North is on someone's payroll. It is not the country of the sour-dough any longer but of the well-manned and well-equipped exploration party. It is a country in which government, no matter how dedicated to freedom of enterprise, cannot avoid playing a major role. These factors could work to limit private participation in northern development unless we are careful to devise policies, information services and other facilities which encourage widespread participation in this most important venture.

In my opinion, the really difficult problems of the North have already been solved. What remains are the refinements to the solution. We still need to find better and cheaper methods of conducting our exploratory activities. We need even greater creature comforts in the North because it is apparent that Canadians enjoy a high standard of living in both senses of the word "enjoy"!

The recipe, as I see it, consists of persistence, patience and perception on a solid base of objective realism.

We need to be realistic about breaking through the psychological barrier regarding the largely fictitious dangers and discomforts of northern living.

And we need to be realistic about the genuine problems which remain—those arising from the lack of an indigenous economy and those arising from the monumental logistics which any northern export industry must face. Emotionalism of either the pessimistic or the optimistic variety can only be harmful to the practical job of work that must be done by those who will make the conquest of the North complete.

His Excellency the Governor General and Mme Vanier with (centre l. to r.) Mr. J. P. White, President of Imperial Oil, Limited (guest speaker) and Maj.-Gen. H. A. Young, President of the Society.

D.P.W. Photo

THE ROYAL CANADIAN GEOGRAPHICAL SOCIETY

ANNUAL GENERAL MEETING

In the presence of His Excellency Major-General Georges P. Vanier, Governor General of Canada, and Mme Vanier, the Society held its thirty-first annual general meeting on Monday, 15 February, in the Lecture Hall of the National Museum of Canada, at Ottawa. The President, Major-General H. A. Young presided over the meeting.

After approval of the minutes of the annual general meeting held 12 March 1959, the President reported on the activities of the Society during 1959:

"Your Excellencies, Honoured Guests, Members of The Royal Canadian Geographical Society and Friends:

"I would first like to welcome most heartily on your behalf to our meeting this evening His Excellency Major-General Georges P. Vanier on the first occasion of his appearance with us as our Honorary Patron. Shortly after his appointment as Governor General, he was kind enough to receive General McNaughton and me in connection with our request that he continue the tradition established by Lord Willingdon when the Society was first formed and continued by succeeding Governors General since that time, in becoming our Honorary Patron. We were most heartened by his enthusiastic response to our request. I would like to thank you Sir, on behalf of the Society, for honouring us in this way and trust that we will be able to live up to the high standards which I know you feel should be maintained by The Royal Canadian Geographical Society.

"In welcoming our new Honorary Patron, I am also honoured to report that we are not losing the services to the Society of his predecessor, the Right Honourable Vincent Massey. Mr. Massey has consented to serve as our Honorary President, replacing in that office Mr. Charles G. Cowan, who is now retiring from active participation in the Society's affairs after many years of devoted service. Mr. Cowan was the first vice-president of the Society when it was organized in 1929. He served in that capacity until his appointment to the presidency in 1944, which position he held until December 1950. He was elected Honorary President of the Society in 1951, and served in that capacity until his retirement from office last fall.

"In addition to an interesting address, we are also going to have this evening two other very interesting events. The first is the presentation of the Armorial Bearings of the Society by His Excellency the Governor General and the other is the presentation of the Massey Medal for 1960, also by His Excellency the Governor General, to Wing Commander Keith R. Greenaway.

"I regret we must record the death of one of the original directors, Dr. Arthur Beauchesne, who at the time of his death last year was still serving as a vice-president of the Society. We paid tribute to his memory in the June 1959 issue of the *Canadian Geographical Journal*. Another sad loss we have to record is that of Dr. Robert J. C. Stead, to whose memory we paid tribute in the August issue. A well-known Canadian, he served on the Editorial Committee of the Journal, both as a member and as chairman, from 1942 until his death on June 25, 1959.

"During the year Mr. Gordon M. Dallyn, our Executive Secretary and Editor of Publications, retired. I would like on your behalf of thank Mr. Dallyn for the excellent service he rendered to the Society for twenty-three years. Mr. Dallyn has been succeeded by Major-General W. J. Megill who left the Canadian Army on completion of thirty-five years of service. General Megill has had a life of effective service in the Army in many capacities. We feel that from this varied experience he is well suited to the administration and expansion of the activities of the Society.

"During the past year we have continued to maintain the high standard of the *Canadian Geographical Journal* and, in particular, to pay attention to our great Canadian North. Our continued aim is to make the Journal an authoritative publication that will keep its readers informed on the major developments that take place

To All and Singular to whom these Presents shall come, the Honourable Sir George Rothe Bellew Knight Commander of the Royal Victorian Order, Garter Principal King of Arms, Sir John Dunamace Heaton-Armstrong Knight, Member of the Royal Victorian Order, Clarenceux King of Arms and Aubrey John Toppin, Esquire, Member of the Royal Victorian Order, Norroy and Ulster King of Arms, Send Greeting Whereas Hugh Andrew Young, Esquire, Companion of the Most Honourable Order of the Bath, Commander of the Most Excellent Order of the British Empire, Companion of the Distinguished Service Order upon whom has been conferred the Canadian Forces Decoration, President of The Royal Canadian Geographical Society hath represented unto The Most Noble Bernard Marmaduke, Duke of Norfolk, Knight of the Most Noble Order of the Garter, Knight Grand Cross of the Royal Victorian Order, Earl Marshal and Hereditary Marshal of England and One of Her Majesty's Most Honourable Privy Council, that the said Society was duly constituted by the name of the Canadian Geographical Society under the authority of the First Part of the (Canadian) Companies Act (Chapter 27 of R.S.C.1927) on the Thirtieth day of May 1929 and that on the Fourth day of October 1957 Her Majesty The Queen was graciously pleased to grant to the said Society the distinction of adding to its title the prefix 'Royal'. That the President and Board of Directors of The Royal Canadian Geographical Society are desirous of having Armorial Bearings duly assigned under Lawful authority and he therefore on their behalf hath requested the favour of His Grace's Warrant for Our granting and assigning such Armorial Ensigns and in the same Patent such Supporters as may be proper to be borne and used by The Royal Canadian Geographical Society on Seals or otherwise according to the Laws of Arms. And forasmuch as the said Earl Marshal did by Warrant under his hand and Seal bearing date the Twelfth day of August last authorize and direct Us to grant and assign such Armorial Ensigns and such Supporters accordingly Know ye therefore that We the said Garter, Clarenceux and Norroy and Ulster in pursuance of His Grace's Warrant and by virtue of the Letters Patent of Our several Offices to each of Us respectively granted do by these Presents grant and assign unto The Royal Canadian Geographical Society the Arms following that is to say:- Azure an Annulet Or surmounted of a Compass Rose of eight points Argent charged in the centre with a Maple Leaf slipped Gules on a Canton also Argent a representation of the Royal Crown proper And for the Crest On a Wreath of the Colours In front of a Canada Goose wings elevated and displayed the northern hemisphere of a Terrestrial Globe all proper as the same are in the margin hereof more plainly depicted. And by the Authority aforesaid I the said Garter do by these Presents further grant and assign unto The Royal Canadian Geographical Society the Supporters following that is to say:- On either side a Malamute sled-dog proper as the same are also in the margin hereof more plainly depicted the Whole to be borne and used for ever hereafter by The Royal Canadian Geographical Society on Seals or otherwise according to the Laws of Arms. In witness whereof We the said Garter, Clarenceux and Norroy and Ulster Kings of Arms have to these Presents subscribed Our names and affixed the Seals of Our several Offices this Tenth day of June in the Eighth year of the Reign of Our Sovereign Lady Elizabeth the Second, by the Grace of God, of the United Kingdom of Great Britain and Northern Ireland and of Her other Realms and Territories Queen, Head of the Commonwealth, Defender of the Faith, and in the year of Our Lord One thousand nine hundred and fifty-nine.

DIGIT AMOR PATRIÆ

The Grant of Arms of The Royal Canadian Geographical Society.

in Canada and, at the same time, publish articles about other countries that will be of particular interest to Canadians. Eight of the articles published last year have been reprinted in booklet form and have been given a wide distribution in Canada and abroad. A further one of these booklets has just come off the press and a further six articles that had appeared in former years were reprinted again: one of these for the tenth time.

"Altogether your Board submits, it has been a satisfactory year. Nevertheless, I cannot record, as I would like to, a substantial increase in our membership. This remains a principal concern of the Society. Many of our costs in publishing the Journal are constant, so that an increase in circulation is a direct financial gain to the Society. Our membership is of the order of 10,000, and we have 454 Fellows in the Society. We have initiated a new membership campaign by direct mail and have made an encouraging start. If we can maintain this progress, I hope we can give you a favourable report next year.

"Our financial statement for the year ending December 31, 1959, shows a loss of some $4,000. Your Board is taking steps to ensure that a different financial situation obtains next year. In April 1959, we presented a brief to The Canada Council outlining our needs and requesting financial assistance over a period of three years to help us in putting on a membership campaign and in improving the quality of the Journal. The latter applies principally to the use of additional colour. It is most gratifying for me to report that we were favourably received by The Canada Council and the Council has agreed to give us a grant of $30,000 spread over a period of three years: $15,000 in the first year, $10,000 in the second year and $5,000 in the third. This is enabling us to finance the membership campaign that I have already mentioned. You may have noticed a modest change of policy in the use of colour in the Journal. Other changes in make-up are under consideration and I hope you will feel they are improving the Journal and that they are furthering our effort to record interesting geographical facts about our country. I refer to geography being interpreted in its widest sense as the discipline which embraces the whole physical and social environment of man. A true geographer must be a man of many parts, with considerable breadth of vision and knowledge.

"In former years I have reported the results of our extension fund campaign. That refers to donations by those interested in fostering the Society. These donations have amounted to some $35,000. They are income tax deductible. Unfortunately, the amount collected had to be utilized in liquidating liabilities and has been insufficient to provide means of expanding our activities. Furthermore, our accommodation on Park Avenue is now becoming congested and it appears likely that we will have to build an extension at a cost of about $9,500. It is our intention to continue our efforts in building up the extension fund during the coming year.

"Financially, although the past year has been somewhat of a struggle, we feel we have weathered it. We feel further that we are building firmly for the future and we hope next year to report a financial improvement. But this is no time for complacency. Further support by The Canada Council will be contingent on the success achieved through our own efforts. Your Board of Directors will do all possible to foster this improvement. But it cannot be successful without the active support of Fellows and members of the Society. The great urgency is an increase in membership and I make the strongest possible appeal to all members and to friends of the Society to assist us during the forthcoming year. Anything that members or friends can do in bringing to the attention of others the work done by the Society and to

encourage them to become regular readers of the *Canadian Geographical Journal* will strengthen the Society and will enable us to meet more effectively the needs of the future and to become a greater force in Canadian affairs."

The report of the Honorary Treasurer was presented by Major-General G. R. Turner. Dr. C. J. Mackenzie presented the Nominating Committee's report and the following directors were re-elected for a three-year term: the Honourable A. E. Arsenault, Mr. D. M. Coolican, Mr. F. R. Crawley, Vice-Admiral H. T. W. Grant, Mr. Eric L. Harvie, Mr. Gilbert LaBine, Mr. G. F. Maclaren, General A. G. L. McNaughton, Mr. V. W. Scully, Dr. J. B. Mawdsley.

The President invited His Excellency the Governor General to say a few words on the occasion of the official presentation of the Armorial Bearings to the Society; these had been designed by Mr. Alan B. Beddoe of Ottawa, and the design had been approved by the College of Arms in London. His Excellency commented:

"Mr. President, Ladies and Gentlemen:

"I am very grateful indeed to you, General Young, for asking me to present to The Royal Canadian Geographical Society the Armorial Bearings which were authorized by the Grant of Arms dated 10th June 1959. Canadians generally are very proud of the Society which has been serving Canada since 1929. The object for which it was founded was expressly stated in the following terms:

'to make itself a real force in advancing geographical knowledge and in disseminating information on the geography, resources and people of Canada.'

"In the following year the *Canadian Geographical Journal* was founded to meet the above-mentioned needs and to publish articles which would be popular in character, easily read, well illustrated, and informative. To you, who I am sure are all familiar with the Journal, I need not say that it has attained an international reputation and has revealed to the world the many aspects of Canada's geography. The Journal is one of our country's best ambassadors abroad.

"The Society, among other achievements, has contributed to research projects, has granted many scholarships and has sponsored public lectures by prominent scientists and explorers. All this is to the credit not only of the Society but of Canada.

"I congratulate the Society on the very appropriate devices which have been chosen for the Arms. I think I cannot do better than quote from a notice issued by the Society about their significations:

'The Arms: Geography brings to mind travel, discovery and the use of charts, hence the navigator's compass. The maple leaf in the centre of the compass rose is intended to indicate activity in this sense pertaining to, and emanating from, Canada. The gold annulet symbolizes the Society or circle of associates. The Royal Crown in the canton is an augmentation of honour appropriate because of the grant of the prefix Royal to the title of the Society.

'The Crest: The Northern Hemisphere depicting Canada is an obvious choice. The Canada goose was chosen as one of the greatest travellers and a native of this country.

'The Supporters: The sled dogs were chosen for their past and continuing usefulness as an aid to the opening up of the Canadian North.'

"It is with great pleasure that I present to you, Mr. President, the Armorial Bearings of The Royal Canadian Geographical Society."

After the unveiling of the Armorial Bearings the President announced that His Excellency would present the Massey Medal for 1960 to Wing Commander Keith R. Greenaway, R.C.A.F. The Massey Medal* is presented by the Massey Foundation and is awarded annually by the Society "for outstanding personal achievement in the exploration, development or description of the geography of Canada." The following remarks were made on this occasion by His Excellency:

"It is a great pleasure for me to pay tribute to Wing Commander K. R. Greenaway of the Royal Canadian Air Force. He has been named by The Royal Canadian Geographical Society for the award of the Massey Medal for 1960.

"I think I cannot do better than read to you the citation published by The Royal Canadian Geographical Society:

'Keith Rogers Greenaway was born in Woodville, Ontario, and was educated there and at Malvern Collegiate, Toronto. He joined the Royal Canadian Air Force in 1940 and qualified as a navigator and wireless operator. He was promoted to commissioned rank in 1944 and was employed on staff and instructional duties until 1946 when he was posted to Edmonton for employment with a United States Air Force B29 detachment carrying out radar mapping and Arctic air development projects. During this period he commenced the development of navigational tech-

*See "First Presentation of the Society's Massey Medal", *Canadian Geographical Journal*, October 1959.

His Excellency presents the Massey Medal of the Society to Wing Commander K. R. Greenaway, R.C.A.F.

D.P.W. Photo

niques that are now generally accepted for flying at high latitudes. From 1948 to 1955 he was seconded to the Defence Research Board and was employed in research on ice reconnaissance, Arctic weather forecasting, northern mapping and terrain studies. During this time, in 1951, he completed the development of a twilight computer, an instrument which enables northern flights to be planned simply and effectively, so as to avoid the difficult navigational conditions which occur at twilight. In 1954 he was sent as a liaison officer to a B47 Squadron of Strategic Air Command of the United States Air Force for employment on projects connected with polar flying operations. Following this tour of duty he was transferred to the Plans Staff at R.C.A.F. Headquarters where he served until 1959, when he was posted to Winnipeg for employment as Commanding Officer of the Central Navigation School of the Royal Canadian Air Force. He has published full reports of his work in scientific journals, is the author of a manual on Arctic air navigation, and co-author of the book *Arctic Canada from the Air*. He is a Fellow of the Arctic Institute of North America, and of the Institute of Navigation. In 1950 he was awarded the President's Prize of the Canadian Branch of the Royal Meteorological Society; in 1952 he received the Thurlow Award of the American Institute of Navigation and the McKee Trans-Canada Trophy for outstanding contributions to the development of Canadian aviation.'

"May I add a personal note about *Arctic Canada from the Air* — a copy of which I have perused with interest and profit. It contains literally hundreds of photographs taken from the air which give one some idea of the immense and fantastic geographic features of Arctic Canada.

"In presenting this Medal to you, Wing Commander Greenaway, Canada's foremost authority on Arctic air navigation, I extend to you my warmest congratulations. I feel sure that Canada will continue to benefit by your knowledge and exploration of the North."

Wing Commander Greenaway accepted the Medal and thanked His Excellency for his remarks:

"Your Excellencies, Mr. President, Members of The Royal Canadian Geographical Society and Guests:

"It is indeed a great honour to receive a Massey Medal and to be associated with the past recipient* who has done so much for Canada. I wish to add, however, that the part that I have played in the development of Polar navigation is only a very small part of the contribution made by Canadian airmen and, in particular, the Royal Canadian Air Force. High latitude navigation has in many ways been a special Canadian subject, and this is as it should be. No other country, except Russia, has such a large area of northland, or is so dependent on the aircraft for its development. I feel that I can say without boasting that we in Canada have led the way in the development of navigation techniques for Arctic flying. The increasing interest and activities in the Far North indicate that Canada will always be involved in high latitude flying. It is up to us therefore to maintain this lead as we will continuously be expected to give advice in this field.

"In closing I would wish to mention that I do not expect to have a more memorable or more enjoyable Polar flight than the one in 1956 when I had the honour of accompanying Mr. Massey on his visit to the Far North."

The President introduced the guest speaker Mr. John R. White, President of Imperial Oil Limited. The text of Mr. White's address appears elsewhere in this issue. After the talk and a showing of films, Mr. R. G. Robertson thanked the speaker and Colonel A. F. Duguid expressed the thanks of the Society to the press.

*Superintendent H. A. Larsen, R.C.M.P.

EDITOR'S NOTE-BOOK

John R. White (*Oil and Canadian Geography*) is President of Imperial Oil Ltd. A native of London, Ontario, he graduated from the University of Toronto with a degree in Mechanical Engineering. He joined Imperial Oil Ltd. at Sarnia, Ontario, as junior draftsman and engineer in 1933, and in 1937 was sent to New York to the parent company, Standard Oil of New Jersey. Mr. White was then sent in 1938 to Venezuela to the Standard Oil Co. of Venezuela, which later became known as the Creole Petroleum Corporation. He was one of the people instrumental in seeing that Venezuelan crude oil reached the Allies during World War II. Mr. White returned to Canada in 1944 and rejoined Imperial Oil Ltd. He was made Vice-President of the company in 1945, and President in 1953.

* * *

W. J. W. (Ian) McNaughton (*Bersimis: The Taming of a River*) is Technical Co-ordinator of the Canadian Electrical Association. He has travelled very extensively in Canada and abroad, and is particularly interested in the less well-known parts of Canada. Mr. McNaughton is a Fellow of the Royal Canadian Geographical Society.

* * *

Robert A. J. Phillips (*Akudlik: The Place Between*) is a graduate of the University of Toronto, and did military service in Europe during World War II. He joined the Department of External Affairs in 1945, and from 1947 to 1949 was secretary of the Canadian Embassy in Moscow. Since joining the Department of Northern Affairs in 1954, he has been appointed Assistant Director, Northern Administration Branch.

* * *

AMONGST THE NEW BOOKS

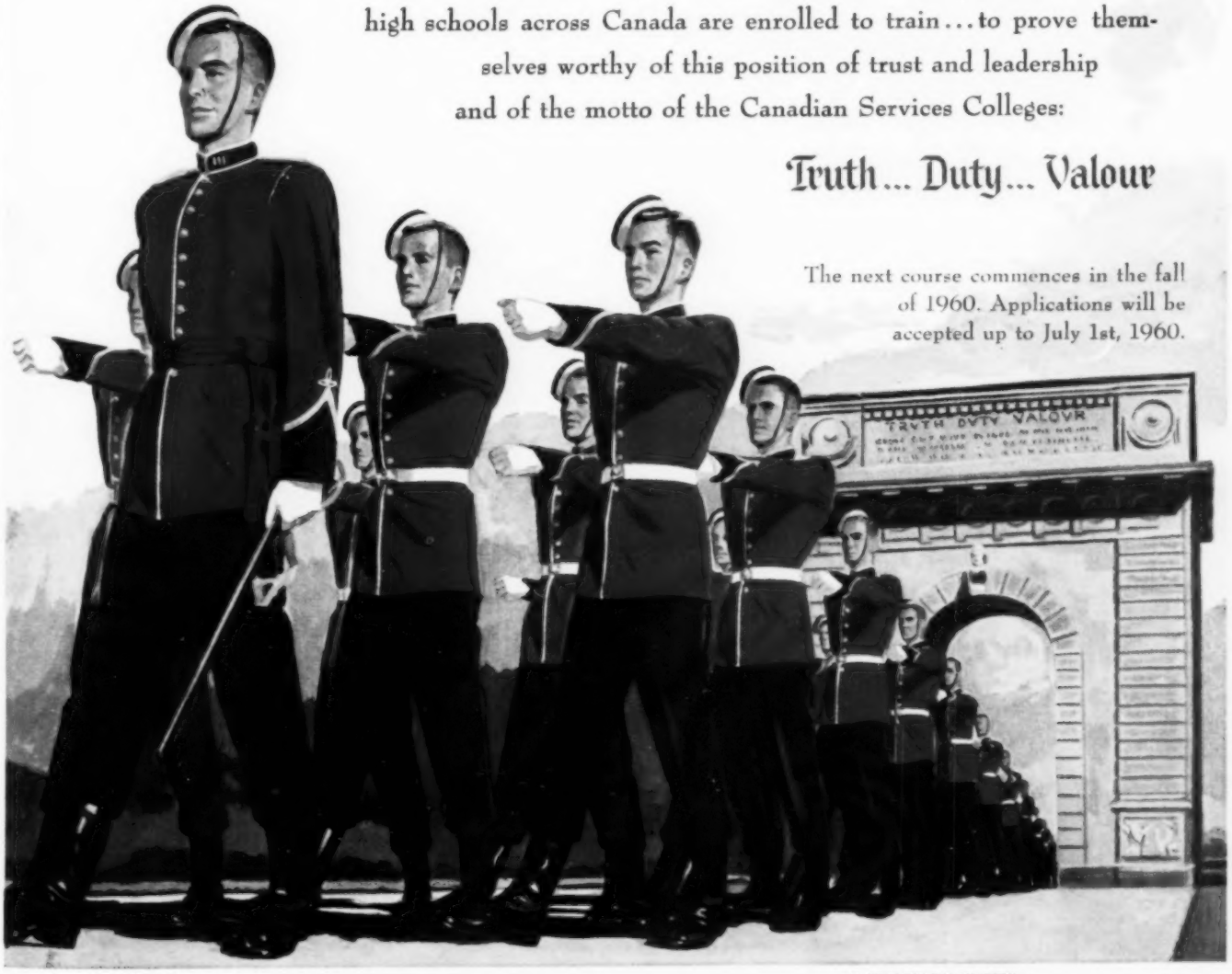
Owing to the amount of space required for the report of the Annual General Meeting of The Royal Canadian Geographical Society, book reviews are omitted from this issue. Book reviews will be included in the May issue as usual.

Truth... Duty... Valour

Heads up, arms swinging, pride showing in their step, these cadets of the Canadian Services Colleges are on the march to a promising future. Back of their training is the past, with noble and exacting traditions that shape their lives as they receive their university education. Ahead lie rewarding careers as officers in the Navy, Army and Air Force. Each year carefully selected numbers of young men from high schools across Canada are enrolled to train... to prove themselves worthy of this position of trust and leadership and of the motto of the Canadian Services Colleges:

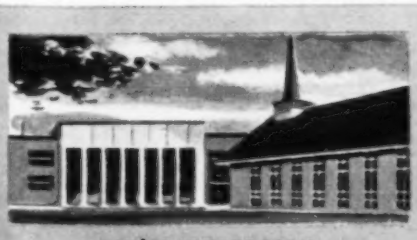
Truth... Duty... Valour

The next course commences in the fall of 1960. Applications will be accepted up to July 1st, 1960.



For full details enquire now at one of your local Armed Services recruiting stations, or write to the

DIRECTOR ROTP,
DEPARTMENT OF NATIONAL DEFENCE
OTTAWA, ONTARIO.



COLLÈGE MILITAIRE ROYAL DE SAINT-JEAN, SAINT-JEAN, P.Q.

ROYAL ROADS VICTORIA, B.C.

ROYAL MILITARY COLLEGE OF CANADA KINGSTON, ONTARIO

TS-59-4M

Remember?

This is the lead dog of the team whose picture will appear on the cover of the Northwest Territories booklet.

Society Affairs

ARMORIAL BEARINGS

The new Armorial Bearings of the Society belong not only to the Society itself but to every member of it. The meaning of each device was explained by our Honorary Patron when he presented the Grant of Arms to the Society at our Annual General Meeting, which is reported on elsewhere in this issue. Prints in full colour, similar to this month's frontispiece but on heavy paper suitable for framing, may be purchased from the Society's office for fifty cents each.

The gold and blue border on the front cover of this issue reproduces the colours of the heraldic wreath in the armorial bearings, gold and blue being the approved colours of the Society.

NORTHWEST TERRITORIES
Geographical Aspects

The feature article of our January issue, "Northwest Territories: Geographical Aspects" by N. L. Nicholson, has been so favourably commented on by our readers that we are reproducing it separately as a 28-page booklet. For those who already have copies of our "Aspects" series on the Provinces (now temporarily out of print) and the Yukon Territory, this will complete the set. For teachers and students especially but also for anyone who is interested in the Canadian North, this will be a useful reference booklet to keep in a convenient place for frequent consultation. Copies of the booklet may be purchased from the Society's office for fifty cents each. Special reduced prices apply on orders of fifty copies or more.

Information About Membership

Once again this month we record an increase in our membership, as members continue to tell their friends about the Society and about the *Canadian Geographical Journal*. An interesting array of articles is scheduled for the coming months — articles that you will want to read and in which your friends will be interested. We welcome new members into the Society and would be pleased to send information about it to anyone whom you would like to nominate for membership.

Non-members are invited to apply for membership or for further information. Possibly, also, you have a friend who is a member and who can tell you about the Journal.
Please copy, or fill out, the form below and send it to:

The Executive Secretary
The Royal Canadian Geographical Society
54 Park Avenue, Ottawa 4, Ontario

Member's Name.....

.....
street

.....
city, zone, province

Candidate's Name.....

.....
street

.....
city, zone, province

Check here

For Members

I nominate for membership in the Society the person named below. Please send him/her information about the Society and about the *Canadian Geographical Journal*. ☐

Please send me .... prints of the Armorial Bearings of the Society. I enclose fifty cents for each print. ☐

Please send me .... copies of the booklet *Northwest Territories: Geographical Aspects*. I enclose fifty cents for each copy. ☐

For Non-Members

I want to become a member of the Society, and to receive the *Canadian Geographical Journal* monthly. I enclose annual dues of five dollars ($5.00). ☐

I desire further information about the Society and about the *Canadian Geographical Journal*. ☐